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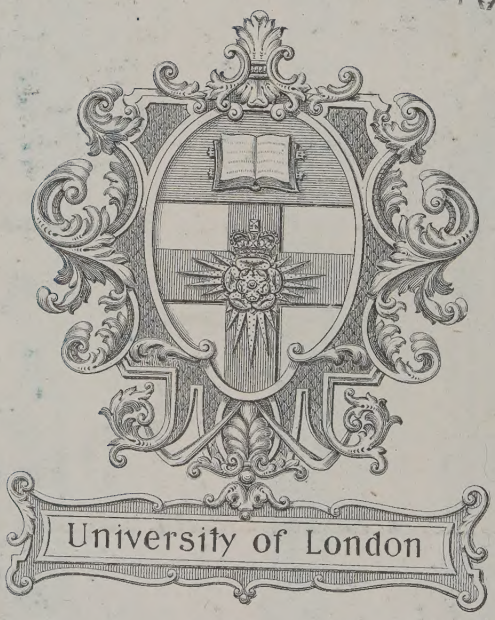

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CHAMBERS'S ENCYCLOPÆDIA

A DICTIONARY OF UNIVERSAL KNOWLEDGE

NEW EDITION

Edited by

DAVID PATRICK, M.A., LL.D.

AND

WILLIAM GEDDIE, M.A., B.Sc

VOLUME X

TEINDS TO ZYRIANS

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Telephone; Telescope	Dr Alfred Daniell.
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Zionism	A. M. Hyamson.
Zola	Professor George Saintsbury.
Zulus	J. Stuart.

A great many of the articles named above are new; others written for earlier issues of this Encyclopædia have been so thoroughly revised by their authors as to be virtually new. In addition to these many other revisers have taken part, including Professor J. A. S. Watson (Agriculture), Professor David Hepburn (Anatomy), Sir Frank Dyson (Astronomy), Dr Drinkwater (Chemistry), Dr R. Campbell (Geology), Miss M. A. Murray (Egypt), Mr G. E. Shepherd (India), Dr Thomas Ashby (Italy), Mr W. A. Fleming, Advocate, and Mr Norman Macdonald, Advocate (Law), Dr J. D. Comrie (Medicine), Dr Alfred Daniell (Physics), Professor A. Berriedale Keith (Sanskrit Subjects), Dr S. A. Cook and Mr Herbert Loewe (Semitic Subjects), and Professor J. Arthur Thomson (Zoology). Thanks are due to many town-clerks and others for information and corrections.

CHAMBERS'S ENCYCLOPÆDIA

A DICTIONARY OF UNIVERSAL KNOWLEDGE

Teinds is the name given in Scotland to tithes. The growth of the tithe system, under which a proportion of what was acquired from year to year from the fruits of the earth and the produce of animals, or from the profits of industry, was devoted to the maintenance of the clergy, is recounted at TITHES. Tithes were at first contributions made voluntarily as a religious duty, and enforced only by ecclesiastical sanctions. But after the practice of tithe-paying became general in western Europe the obligation to pay tithe was recognised and enforced as a civil obligation.

In the canon law tithes are divided into (1) personal and (2) predial. Personal tithes are those derived from the profits of trading or personal industry. Predial tithes are those derived from the natural and industrial fruits of the earth. In Scots law, however, personal teinds, save in exceptional circumstances, were not recognised. Predial teinds were, in Scots usage, divided into two classes, viz. parsonage and vicarage teinds. Parsonage teinds, called also *decimæ rectoriæ* or greater teinds, consisted of those drawn from cereal crops, such as wheat, bere or barley, and oats; vicarage teinds, called also lesser teinds, comprised those drawn from certain natural and less valuable kinds of agricultural produce, e.g. natural grass and garden-produce, as well as certain animals and their produce, e.g. fish, calves, lambs, wool, butter, and cheese. Vicarage teinds depended on custom, and in course of time have been, in most parishes, lost by desuetude. By statute 27 and 28 Vict. chap. 33, provision was made for vicarage teinds on fish being commuted into a capital sum.

With the rise of the parochial system, under which the local churches were served by resident priests, it became an established principle of canon law that the parish priest had right to the parish tithes. But in Scotland this rule, embodied in the maxim *decimæ debentur parocho*, was never fully applied and acted upon, and, long before the Reformation, the teinds due under the canon law to the incumbent of the parish had in various ways been encroached upon or diverted. In particular, the emoluments of the acting parochial clergy were greatly diminished by the practice of appropriating the teinds of parishes to other churchmen or to religious houses. On a vacancy occurring in a parochial charge it frequently happened that the lay patron—that is to say, the layman who, having himself built or endowed the church or being the representative of the person who had done so, had the right to present an incumbent to the benefice—assuming to act as if he were the absolute proprietor of the benefice, granted or appropriated it to a monastery or a cathedral. By such an appropriation or annexation the monastery or cathedral acquired not only the right to present to the benefice, but also the right to its revenues. A parochial church, if appropriated or annexed to a cathedral, might be vested in the bishop, in which case it was styled 'mensal,' as being for the support of the expense of his table; or it might be vested in the chapter, in which case it was styled 'common,' as being for the common behoof of all the members of the chapter. In practice the cure of an annexed church was served by a resident vicar or deputy, who received either a stipend in money or such share of the teinds as the non-resident rector, or corporate body holding the rectorial rights, thought fit to allow him. A common arrangement was that the lesser teinds should be the vicar's portion; and so usual was this arrangement that, as already mentioned, the lesser teinds came to be generally called 'vicarage' teinds. Another cause operating to the disadvantage of the parochial clergy was the frequent infeudation of teinds to laymen. Although the disposal of tithes to laymen had been prohibited by several Lateran Councils, grants of part of the teinds of vacant benefices in Scotland were frequently bestowed by patrons on needy lay friends. Further, a considerable proportion of teinds was

diverted from the support of the parochial clergy by the practice, adopted by certain popes, of granting to privileged religious orders exemption from the payment of tithes out of lands held by them. Subsequently also a custom grew up of granting feus of such church lands *cum decimis inclusis*, grants which conferred on the grantees—subject to certain limitations—the same exemption from the payment of teind which the ecclesiastical proprietors had formerly enjoyed.

In early times the parsonage teinds, consisting of the tenth sheaves, were 'drawn' or uplifted from the fields during harvest. This practice was a hardship to the cultivators of the soil, as they were obliged to allow the crop to remain on the ground, exposed to all the vicissitudes of the season, until the teind was drawn. Consequently, even prior to the Reformation, it was common for heritors to enter into contracts for the conversion of parsonage teinds into fixed annual sums of money or for delivery of a quantity of grain or victual, called 'rental bolls.'

The possessions of the church in Scotland prior to the Reformation—styled, generically, benefices—embraced the lands bestowed on churchmen—called the 'temporality'—and the teinds—called the 'spirituality.' At the Reformation the great bulk of these possessions was by annexation, resignation, or otherwise acquired either by the crown or by other laymen. The church lands were for the most part erected into temporal lordships. The holders of these lordships were termed 'lords of erection,' while those persons who obtained grants of teinds were described as 'titulars of teinds.' The possessions of the church having thus passed into the hands of laymen, difficulty was experienced in obtaining stipends for the reformed clergy. To meet this difficulty Acts of Council were passed ordaining that rentals be returned of all the ecclesiastical benefices within the kingdom; and that one-third of the revenues thereof be collected and applied in providing stipends for the reformed clergy and in supplying the needs of the crown. This scheme, known as the 'Assumption of Thirds,' was subsequently ratified by parliament in the Act 1567, chap. 10, which enacted that the thirds of the benefices should be first applied for the support of the clergy, and that payment should be enforced notwithstanding any discharges granted by the crown. In 1573 a commission, styled the 'Commission of Platt,' was appointed to apportion stipends locally out of the thirds. On James VI. attaining majority the Act of Annexation of 1587 was passed, annexing to the crown, subject to certain specified exceptions, the temporalities of church benefices, that is to say, church lands. In 1606, when bishops were restored, this annexation was rescinded so far as it related to the benefices of bishops. The Act of Annexation of 1587 did not apply to teinds, and the Commission of Platt—although its functions were greatly diminished after the restoration of bishops in 1606—probably continued to act until 1617, in which year the system of thirds was brought to an end and the first parliamentary teind commission was appointed, with power to award stipend to the minister out of the teinds of each parish. Teinds, in so far as not required for stipend, remained in the possession of the titulars.

Charles I., immediately after his accession in 1625, by an Act of Privy Council, in view of the extent to which the property and revenues of the church had been dilapidated, revoked all grants of church lands and teinds made during the preceding reigns. In addition, he, in 1626, raised a general reduction of all grants and claims inconsistent with the Act of Annexation and the vested rights of the crown. As the individuals who had profited by the prodigality of the crown were very numerous, these proceedings caused wide-spread alarm, and a strong petition or remonstrance was addressed to Charles, with the view of obtaining some modification of his demands. Eventually a compromise was agreed upon, and the parties principally concerned entered into four submissions, under which the whole questions in dispute were referred to the determination of the king. By the decrees-arbitral, pronounced on 2d September 1629, on these submissions, the crown was held entitled to repurchase the superiorities of erection at certain rates; but this power was never exercised, and ultimately under the Act 1707, chap. 84, passed immediately before the Union, the successors of the lands of erection were left in possession of the church lands. As regards the teinds, there was conferred on heritors who did not own the teinds of their lands the power to have the teinds of their lands valued and the yearly charge thus permanently settled; and, in addition, the heritor was given the right to bring an action of sale against the titular or his tacksman, by which he could obtain right to the teinds at nine years' purchase of the value. The findings of the decrees-arbitral relating to the superiorities of erections and the valuation and sale of teinds were subsequently ratified by a series of acts of parliament in 1633. To the rule that a heritor was entitled to purchase, and the titular was bound to sell, the teinds, certain exceptions were made either under the decrees-arbitral or by subsequent legislation. Thus, as finally settled by the Act of 1693, chap. 23, the following teinds could not be sold: (1) Bishops' teinds, so long as belonging to the crown—these teinds having, on the abolition of Episcopacy after the Revolution Settlement of 1688, fallen to the crown; (2) teinds granted to burghs for pious uses; (3) teinds belonging to colleges and hospitals; and (4) teinds in general mortified for charitable purposes. These classes of teinds, though they could not be sold, might none the less be valued at the suit of the heritors liable in payment.

In 1627 a commission, known as the 'Commission of Surrenders and Teinds,' had been appointed to treat for surrenders of disputed rights, and in 1628 this commission was authorised by the king to name sub-commissioners for the valuation of teinds. By the Act 1633, chap. 19, a second commission, known as the 'High Commission,' or the 'Commission for the Plantation of Kirks and the Valuation of Teinds,' was nominated for the purpose of giving effect to the decrees-arbitral. These commissioners were instructed to carry out the valuation of teinds, and were authorised to appoint sub-commissioners to conduct local inquiries for this purpose. The reports of the sub-commissioners—known as sub-valuations—became effectual on confirmation by the High Commission. The Act of 1633 also conferred power on the commissioners therein named to modify a stipend to each minister to be paid out of the teinds of the parish. From time to time this commission was continued with increasing powers, or rather, successive commissions were appointed with more ample powers of uniting and disjoining parishes, and of transporting churches to more convenient places. At the Union the powers exercised by the then extant commissions were, by the Act 1707, chap. 9, vested in the judges of the Court of Session, in the character of Commissioners of Teinds. The administrative and judicial powers of the judges sitting in what came to be known as the Court of Teinds were subsequently regulated in a series of statutes—their powers in relation to the augmentation and modification of stipends being regulated in particular by an act passed in 1808 (48 Geo. III. chap. 138).

The chief interest of the church in teinds, as the law stood at the date of the Church of Scotland (Property and Endowments) Act, 1925, was the right on the part of the ministers of the old parishes of Scotland to have competent stipends awarded to them by the Court of Teinds out of the teinds of their respective parishes in so far as these were adequate. The minister of such a parish had the right, if he thought his stipend no longer competent, to apply at intervals of not less than twenty years to the Court of Teinds for an augmentation of stipend. (See AUGMENTATION, PROCESS OF.) The process of augmentation was combined with what was called a locality, whereby the proportion payable by each heritor was allocated on him. When it happened, as was the case in the majority of parishes, that the whole teind of the parish had been awarded to the minister as stipend, and the teind was thus exhausted, the stipend could not be further increased. The Court of Teinds, as a general rule, in conformity with the requirements of section 8 of the Teinds Act, 1808, awarded stipends, not in money, but in grain measured by chalders, which had to be converted into money before the money value of the stipend could be ascertained. The conversion was made on the basis of the Fiars Prices (q.v.) struck annually in each county, which rose and fell with the price of grain.

The Act of 1925 (15 and 16 Vict. chap. 33) makes provision for the conversion, at the standard of value defined in the act, of every stipend which in any way or to any extent depends upon fluctuations in the price of grain—referred to in the act as victual stipend—into a stipend having a fixed money value and payable only in money. The conversion is termed the standardisation of the stipend. (See STIPEND.) As regards teinds, the act provides that there shall be prepared by the clerk of teinds a teind-roll for every parish in Scotland specifying in money—(*a*) the total teind of that parish; (*b*) the amount of that total applicable to the lands of each heritor; (*c*) the value of the whole stipend payable to the minister, so far as payable out of teinds; and (*d*) the proportion of that value payable by each heritor in the parish. When the teind-roll of a parish has been made up, liability for stipend is dealt with differently according as the annual amount payable by a heritor exceeds, or does not exceed, £1. On the one hand, where the proportion of the stipend, as standardised, exigible from the teinds of the lands of a heritor, as shown by the teind-roll, exceeds £1, the proportion so exigible is constituted by the act, as at and from the first term of Whitsunday or Martinmas after the date when the teind-roll becomes final, a real burden—termed the 'standard charge'—on those lands in favour of the General Trustees of the church—a burden or charge preferable to all other securities or burdens not incidents of tenure. The amount of the standard charge is to be payable to the General Trustees half-yearly at Whitsunday and Martinmas, and to be recoverable by the same means and in the like manner as a feu-duty. The standard charge over any lands may, at the option of the heritor of those lands or other person liable in respect of the standard charge, be redeemed in one of two ways specified in the act. Provision is also made for the allocation of the standard charge in the event of the sale or conveyance of part of the lands over which it is secured. On the other hand, where the proportion of the stipend, as standardised, exigible from the teinds of the lands of a heritor, as shown by the teind-roll, does not exceed £1, the heritor or other person liable in payment thereof is bound to redeem the amount by payment to the General Trustees of a capital sum calculated at eighteen years' purchase, or alternatively in eighteen years by half-yearly payments. Where the proportion of the standardised stipend exigible from the teinds of all the lands of a heritor, as shown by the teind-roll of the parish, does not exceed one shilling, the liability for stipend is extinguished as at the first term of Whitsunday or Martinmas occurring not less than three months after the date on which the teind-roll of the parish becomes final. As from the date of standardisation, the standardised stipend is payable by the heritors to the General Trustees half-yearly until the standard value of the stipend, as shown by the teind-roll, is constituted a real burden on the lands of the heritors or has been redeemed or extinguished. On the passing of the Act of 1925 the then existing law relating to augmentation of stipend ceased to have effect. The conditions under which stipend may be augmented under the act are summarised in article STIPEND. Elaborate provisions are made, in the fifth schedule of the act, with regard to the preparation, issuing, and adjustment of teind-rolls, and, in the sixth schedule, with regard to the valuation of teinds and the surrender of valued teinds.

See Elliot, *Teinds and Procedure in the Court of Teinds* (1893); Duncan, *Parochial Ecclesiastical Law of Scotland* (revised edition, Johnston, 1903); Connell, *Treatise on Law of Scotland respecting Tithes* (2d ed. 1830); Buchanan, *Treatise on Law of Teinds* (1862).

Tekeli, or TÖKÖLY, PRINCE EMERICH (1657–1705), Hungarian soldier, was born at Käsmark in Upper Hungary, but fled from the religious persecution of Leopold I. to Transylvania. There in 1679, aided by Turks and Transylvanians, he headed a rebellion of the exasperated Magyars, and was successful enough to force the emperor to an armistice. In return for a yearly tribute the Turks gave him the title of Prince of Hungary, and he gave them good aid in their attempt to take Vienna in 1683. Thereafter he tried to effect a reconciliation with the emperor, but failed; and, falling into ill favour with the Turks, he spent a time in prison. On his release he made three expeditions into Transylvania, winning a great victory at Zernest in 1690 and the title of Prince of Transylvania. Later he served for the Turks against Austria, but being excluded from the amnesty contained in the Peace of Carlovitz (1699) he retired to Constantinople. He died at Nicomedia in Asia Minor and was buried there, but his remains were translated to Hungary in 1906. See HUNGARY.

Tekna, the country south of Morocco, extending from the Draa to Cape Bojador, a Spanish possession.

Telegony is the supposed influence on the future progeny of a female from the sire with which she had formerly been mated—a theory widely accepted amongst breeders. In a case described by Darwin, a mare mated with a quagga produced a colt such as might have been expected. The same mare, subsequently mated with a black Arab stallion, bore two colts in succession showing well-marked stripes. But Cossar Ewart and others have carried out extensive experiments in this connection with merely negative results. See HEREDITY; Cossar Ewart's *Penicuik Experiments* (1899); J. A. S. Watson's *Heredity* (1912).

Telegraph (Gr. *tēle*, 'far off,' and *graphō*, 'I write'). This is a general name for any means of conveying intelligence other than by voice or by the transmission of written messages. Perhaps also the idea of speed is generally understood. Alarm fires (see BEACON), Heliography (q.v.), the Semaphore (q.v.), and Signalling (q.v.) as used at sea are among the earlier forms of telegraphy; and while these methods are still employed in their particular spheres, they are not to be compared for

speed or convenience with those systems of communication which depend upon electricity for their motive power, and of which the electric telegraph was the first type.

The idea of telegraphic communication by means of magnets is certainly more than three centuries old. In 1617 the possibility of communicating by means of sympathetic needles was assumed by one Strada, a famous Roman Jesuit. In 1632 Galileo, the great astronomer, referred to a secret art by which, through the sympathy of magnetic needles, it would be possible to converse at great distances. Again, in 1753, when a more defined idea of electricity had begun to dawn, a letter appeared in the *Scots Magazine* signed 'C. M.' (now almost certainly recognised to be Charles Marshall, a native of Greenock, who practised as a surgeon at Renfrew, whence the letter emanated), in which 'an expeditious method of conveying intelligence from one place to another by means of electric power was so clearly set down that we cannot but recognise that the writer must have had a considerable appreciation of the possibilities of electric communication. Many quiet workers occupied this field of research from that time until 1837, which is the generally recognised year of the birth of the electric telegraph. Limited space forbids anything but a passing reference to the work of the fathers of the telegraph. If a comparison may be made, we may say that what Wheatstone and Cooke did in the development of the needle system of telegraphy in England, Morse and Alfred Vail did in the development of the Morse-recording and sounder-reading systems in America. The claim that may justly be made for the recognition of the genius of either workers does not in the least militate against the recognition of that of the others; but it must be conceded that while the method originated by the English inventors has found acceptance principally in England, the Morse system is of world-wide use, and has supplanted the other even in England except for railway working, for which the needle system is most admirably suited. We must now proceed to furnish such information as will give some idea of the present state of the science, with some notice of the more important systems in use in Britain. In doing this it will be necessary to assume on the part of the reader some general knowledge of the chief features of Electricity (q.v.; and see also MAGNETISM).

The general subjects dealt with occur in the following order, and it may be noted that special terms have been included and explained as far as possible. I. *Construction*—(1) lines, overhead and underground; (2) poles and insulators; (3) wire; (4) earths and earth-currents; (5) circuit; (6) batteries—universal battery. II. *Apparatus*—(1) needle system and Morse code; (2) the sounder system; (3) the Morse recorder; (4) the relay, polarised and non-polarised; (5) polarised sounder (Vyles); (6) double-current system; (7) duplex; (8) quadruplex; (9) Wheatstone automatic; (10) type-printing systems—multiplex telegraphy; (11) news circuits; (12) repeaters; (13) submarine telegraphy—cables.

I. *Construction.*—(1) *Telegraph lines* may be either overhead or underground. The overhead system has many advantages, and is generally adopted where the number of wires is not too great to be carried by one line of poles. The first cost is very much lower, the open wires are better for working purposes, and faults can be more easily traced and removed. On the other hand, climatic conditions do not affect underground lines, while a severe storm will sometimes do so much damage to open work as to cripple the whole system. Where more than one pole-line is required to carry the wires, the underground method may be the cheaper. For this reason, and in order to secure immunity from breakdown due to storms, most of the important industrial centres in England and Scotland are now connected with London, and in many cases with each other, by underground cable. The lines in large towns in Great Britain are all necessarily underground.

(2) *Poles and Insulators.*—Overhead wires are supported for the most part upon creosoted wooden poles by means of insulators. No hard and fast rule can be given as to the number of poles that should be used. For minor lines twenty or twenty-two to the mile may be used, but on main lines the number should be between twenty-six and thirty. Ordinarily the lowest wire on a pole should be not less than 12 feet from the ground, so that, allowing for setting in the ground (which varies from 4 feet to 6 for ordinary poles), and the sag or dip of the wire between the poles, the length of the poles used on branch lines is usually about 20 or 22 feet, and this is increased by 1 foot for each two additional wires required. The object of the insulator is to isolate the wire from anything which would be liable to conduct the current from the wire; the material of which the insulator is made is therefore of much importance. White porcelain is used chiefly, but brown earthenware and brown stoneware are both employed. Porcelain possesses rather better insulation properties than these. Glass is used in some directions on the Continent, and largely in America, but it has a tendency to condense moisture, which is against it for long lines especially. Brown insulators are less conspicuous than white, and are therefore less of a mark for stone-throwers. The heads of standard types of insulators are threaded internally to take the screwed spindle, and so to facilitate the removal or renewal of the insulator.

(3) *Wire.*—Hard-drawn copper, bronze, and galvanised iron wire (i.e. iron wire coated with zinc) is used. Copper wire is preferred for long lines, because of its better conductivity and its comparative immunity from corrosion. Bronze wire, the chief constituent of which is copper, is approximately 50 per cent. stronger than copper, and is used on long spans and in other directions where a greater tensile strength than that afforded by copper is required. Iron wire is no longer employed in Great Britain, but it is still largely used in the dominions and colonies, owing to its cheapness as compared with copper and bronze; also it is less liable to be stolen by natives in countries where copper-wire rings and bangles are a favourite form of personal adornment. Copper and bronze wires are usually secured to the insulators with copper tapes and binders, while iron wires are bound to the cups by means of a small-gauge soft galvanised iron wire. Underground wires are of soft copper insulated with paper, laid up in cable form, and encased with lead. The cables are usually drawn into ducts of stoneware or into iron pipes for protection and to facilitate handling, but in some cases they are armoured with steel tapes and laid directly in the ground. Where ducts are used, jointing chambers or boxes are provided at intervals, to afford a means of getting at the wires for jointing, testing, and tracing faults.

(4) *Earths.*—In 1838 Steinheil discovered that, if a good electrical connection is made with the ground at each end of a single line, the earth will act as a substitute for a return wire. This was a very important discovery, for not only does it save the expense of a return wire, but it also reduces the resistance of the line by nearly half, with several attendant advantages. The technical expression 'earth' is applied to this connection, and

an 'earth' may consist simply of a wire attached to a metal plate of a large surface buried in soil that is sure to be always damp; but metal pumps, or better still the iron water-pipe system in towns, will generally form excellent earths. Iron gas-pipes will do very well in default of water-pipes, but on no account must *leaden* gas-pipes be used, as there is a possibility of a discharge of lightning fusing the pipe and causing an explosion or a fire by igniting the gas. *Earth-currents.*—From causes as yet unexplained different parts of the earth are frequently at different potentials, so that, if two such points be connected by a wire joined to earth at each end, it is traversed by an *earth-current.* Such currents vary during different periods of every day, and at certain periods they acquire such strength as to be termed 'electric storms.' They then may often render ordinary working impossible, and on long cable circuits may even endanger the safety of the cable. In order to secure communication in such circumstances it suffices, where practicable, to use a return wire instead of earth. Lines whose terminations run north-east and south-west are most liable to interruption.

(5) *Circuit.*—This term, which is of very frequent use, implies the whole path along which a current of electricity may be supposed to flow; that is, for instance, the battery, lever of key, line-wire, coils of receiving apparatus, and the 'earth' at each end. *Short-circuit* implies that the circuit between two particular points (say the two ends of a coil of wire) is bridged across by a conductor of no resistance.

(6) *Batteries.*—Where primary cells are employed, as in the smaller telegraph offices, the Leclanché, of either porous pot or 'sack' type, is now used almost exclusively. Formerly the Leclanché cell was not sufficiently 'constant' for the continuous withdrawal of current imposed upon it in telegraph working, especially on busy lines, and cells of bichromate and Daniell's types were employed. Dry-cells are also used, particularly where portability is desired. In the larger offices secondary cells have been very largely introduced. Ordinarily each set of apparatus at an office has a separate battery, but by a well-recognised law of electricity the universal battery system is applied when several circuits terminate in one office. By this system several sets of instruments are joined up to a common battery, each working independently. Where primary cells are used, the circuits served from the one battery must have about the same resistance, but with secondary cells any number of circuits of different resistances can be served from one common battery.

II. *Apparatus.*—(1) *The Needle System.*—In the earliest form of telegraph instrument, devised by Cooke and Wheatstone, five needles were used, each worked by two wires; this number was subsequently reduced to two, and now a single needle only is employed. Fig. 1 shows the dial of such an instrument. The needle normally hangs vertically, and is capable of motion to the right and left between two stops. The signals are formed by combinations of the two directions of deflection. The alphabet in general use, which is shown above on the face of the dial, is due to Professor Morse, and is hence called the 'Morse Code.' The letters most frequently used—*e* and *t*—are represented respectively by a deflection to the left and to the right. All the other letters of the alphabet are formed by two, three, or four combinations—the length of the signal for each letter being arranged with approximate reference to the frequency of its occurrence in ordinary English writing. In the same way the numerals, stops, and other signals are formed. The figures are represented by *five* signals, thus:

Fig. 1.

(1) . — — — —	(6) — . . . .
(2) . . — — —	(7) — — . . .
(3) . . . — —	(8) — — — . .
(4) . . . . —	(9) — — — — .
(5)	(0) — — — — —

and the stops, &c. by six combinations. The dots and dashes represent respectively deflections to the left and right. Figures, however, are always spelt in full on the single needle. The needle system is specially English, and is used almost universally for railway telegraphs throughout the three kingdoms. It has no equal for working a large number of offices on one circuit, and it has the great advantage of being extremely easy to learn and simple to work.

(2) *The Sounder System.*—For commercial telegraphy, however, the sounder system is distinctly the most generally serviceable of hand-worked systems. Opposite the poles of an electro-magnet is placed a soft-iron cross-piece or *armature*, fixed upon a lever which is so pivoted that a spiral spring attached to the end of one arm tends to hold the armature away from the poles of the magnet. The passing of a current through the coils causes the armature to be attracted, and its motion is limited by two adjustable screws which are so arranged that the two sounds emitted when the end of the lever strikes upon them are easily distinguishable. Sound-reading then consists really of noticing the intervals of silence between these two sounds. The Morse code as shown above is used, and (1) a *dot* is represented by a very short interval of silence between the downward stroke and the upward stroke of the armature lever; (2) a *dash* is represented by an interval three times as long; and in the same way the *space* between (3) the elements of a letter; (4) the letters of a word; and (5) the words of a sentence are represented by intervals between the downward and the upward strokes respectively equal to one, three, and five *dots.* The instrument by which these signals are spaced out at the sending station is called a *key.* A *single current key* consists simply of a lever so

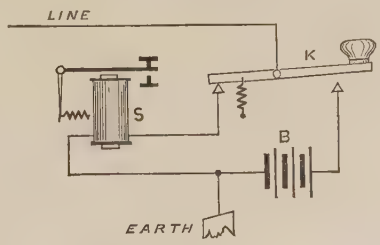

Fig. 2.

pivoted as to make electrical contact with one or two stops. This is shown diagrammatically at K in fig. 2, where B represents the battery and S the sounder. Normally a spring holds the lever of the key in the position shown, so that signals sent from the other stations pass from line to the lever of K, thence by way of the back stop through the sounder to earth. When, however, the handle of

the lever is pressed a current passes from the battery, B, by way of the front stop and the lever of the key to the other stations. Thus the duration of the signals received at a distant station is determined by the periods during which K is depressed. The sounder system is worked on the open circuit method in England, but under some administrations the 'closed circuit' method is adopted. Under this method current from a battery at one or more stations on the line is always flowing, and the line is operated by first breaking the circuit by means of a switch. When it is thus broken, each depression of the key closes the circuit, and so produces signals.

(3) *The Morse Recorder.*—This instrument was the precursor of the sounder just described. The received signals were impressed on a paper tape, from which they were transcribed by the operator, and the tape was preserved for reference in the case of an error in the transmission of a message. Many devices for obtaining this tape record were put forward: one of the earliest was the Morse embosser, whose modern representative is known as the inker or recorder. As shown in fig. 3, the

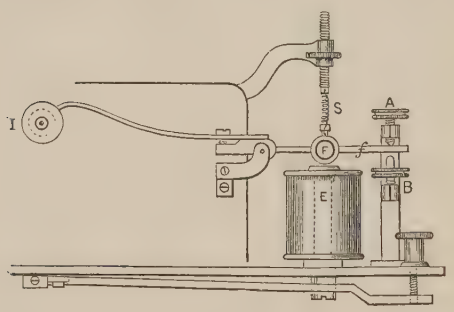

Fig. 3.

combination of the electro-magnet, E, with the armature, F, fitted upon the lever, *f*, which is adjustable by the stops, A, B, and the spring, S, is virtually a sounder, the lever of which is prolonged beyond the pivot and fitted with a small disc, I, kept constantly rotating in a well of ink; above this inking disc a strip of paper is moved forward by clockwork, so that whenever the armature is attracted by the electro-magnet the disc makes ink-marks upon the paper of a length proportioned to the period of attraction. Thus the *dots* and *dashes* of the Morse code can be recorded. For ordinary telegraph work the recorder is now used only in special circumstances. Where a permanent record of the signals is required, as in some methods of railway working, it still finds a place of usefulness.

(4) *The Relay.*—For such instruments as the sounder and the Morse recorder, however, where a comparatively considerable mechanical effect is required in order to secure satisfactory signals, a current must be used of such a strength as for a long line would absorb an inconveniently large amount of battery power. To obviate this a *relay* is introduced. A relay is practically a delicate form of the electro-magnet and lever of the sounder. The coils are wound with a finer and longer wire—finer only to get increased length of wire in the available space—and all its parts are proportioned with a view to the armature being actuated by very weak currents. The lever and limiting stops, which in this case are electrically insulated, are made to act as a key, and by this is introduced a *local battery* situated at the receiving station, by means of which the sounder or other receiving instrument is actuated. The forms of relay are very numerous; but they may be divided into two groups —*non-polarised*, which are actuated alike by currents in either direction; and *polarised*, in which the armature, being either itself a magnet or permanently magnetised by a magnet placed in close proximity, is actuated according to the direction of the current. The form which is now most commonly used in England is the Post-office standard relay, the principle of which will be easily understood from fig. 4. Two coils, A and B, are fitted upon soft-iron cores having projecting pole-pieces, and are so fixed that two soft-iron armatures, *n*, *s*, fitted upon a common axle, may play between them. These two armatures are polarised by the magnet, N′S′, brought near to their axle, and the two coils are joined up so that on the passing of a current their adjacent poles are of opposite polarity. Thus, if a current pass which makes the upper end of A of north polarity, the upper end of B will be of south polarity; A will therefore tend to repel *n*, and B will attract it; similarly (because the lower ends of A and B are then respectively south and north) *s* will be repelled from A and attracted towards B. All the forces therefore tend to move the armatures in the same direction, and so produce a very sensitive combination. The contact lever is fitted upon the axle with the armatures, and the contact stops are placed on either side.

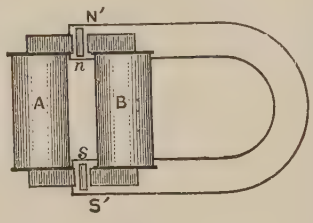

Fig. 4.

(5) *Polarised Sounder* (*Vyles*).—This instrument is similar in appearance to the standard sounder used by the British Post-office. The cores of the electro-magnet are polarised by means of a permanent magnet fitted in the base of the instrument, the poles of which are adjacent to the cores. The armature of the sounder is actuated electrically in a manner somewhat similar to that of the relay above described. The coils are wound differentially, and the instrument is therefore suitable for either simplex or duplex working. On working lines it displaces the relay and its attendant local battery, and its design ensures a remarkable degree of sensitivity.

(6) *Double-current System.*—In this system both poles of the sending battery are brought into play alternately in order to produce 'spacing' and 'marking' signals. The key is so designed that during transmission there is always a current passing to line, this current being in one direction when the key is up, and reversed when the key is depressed. Thus, with a polarised relay the 'spacing' current holds over the relay tongue to the spacing side, so that the spring or other power otherwise required for this purpose may be almost dispensed with; and consequently the relay will be actuated by a much less powerful 'marking' current than would be required for single-current working. In fact, double-current expedites working, reduces the current required (and so tends to increase the working distance of a telegraph line), facilitates the intercommunication of several stations on a single circuit, and is a very important feature in an extensive system.

(7) *Duplex System.*—By this system messages can be sent on one line in both directions at the same time, thus practically doubling the carrying capacity of the wire, because station A can transmit a message to station B while B is sending another message to A. Under ordinary

circumstances, when A is working to B on the open circuit principle, any interference on the part of B disconnects his receiving instrument, and so prevents A's signals from being recorded, because the back stop is disconnected (fig. 2). If now it can be arranged that the receiving instruments at both stations can be always in circuit, yet only affected by the currents sent from their own station when these currents interfere with the currents sent from the other station, then duplex telegraphy becomes possible. There are several modes of doing this, but we shall confine ourselves to a description of the *differential* method, which is almost exclusively that adopted in the British postal telegraphs.

If two circuits of precisely equal resistance be open to a current, it will divide itself equally between the two, and the currents in each wire will be exactly equal. If, for instance, the wire, *Zl*E (fig. 5), offer the same resistance as the wire, Z*r*E, the current in *l* will have precisely the same strength as the current in *r*. Now let an electro-magnet be similarly wound with two wires of equal length, one of which is in the circuit of *l*, and the other in the circuit of *r*. If the current through *l* traverse the electro-magnet in the reverse direction to that through *r*, it is evident that if the currents be equal the polarity induced by the one current must be exactly neutralised by that induced by the other current, for the effects are equal and opposite, and there will be no magnetism excited. Thus, as long as the two circuits are intact, the currents which flow will not affect the electro-magnet; but if the currents in *r* be interrupted, those in *l* will excite the electro-magnet, and if those in *l* be interrupted, the currents in *r* will excite the electro-magnet.

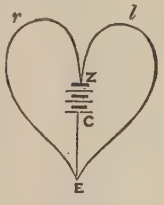

Fig. 5.

Assume A and B (fig. 6) to be two stations connected together by the line-wire, *l*. Let E be an electro-magnet at A, wound as just described, K a key, and Z a battery. Let *r* represent resistance coils

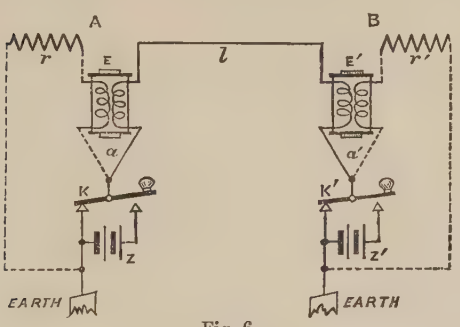

Fig. 6.

or an artificial line, giving a resistance equal to the line circuit. Have a precisely similiar arrangement at B, as shown. Now let us in the first place assume A alone to be working to B; every time the key, K, at A is depressed a current is sent from A's battery. This current divides at *a*, the one half going through the wire in connection with *l* in E, through *l*, and at B, through the wire in connection with *l* in E′, through the key, K′, to earth and thence back to the battery at A. This is called the *line current*. The other half, which is called the *compensation current*, passes around the electro-magnet, E, through the coil in connection with *r*, through *r* and back to the battery. As these two currents are equal, their effect on E is *nil*, but the line current passing through one coil only of E′ operates it and causes signals to be given. Thus while A telegraphs to B its own instrument is not affected, but that at B is actuated. Similarly, when B alone is working to A its own instrument is not affected, but that at A is actuated. But when B is working to A at the same time that A is working to B, what happens? Every line current that leaves A at the same time that a line current leaves B is neutralised. The compensation current at A is now able to excite the electro-magnet, and the armature is moved in precisely the same way as if B's current were received. In the same way B's line currents are neutralised, and its compensation currents move the armature of E′ in precisely the same way as if A's currents were received. Thus E and E′ continue to be worked by their respective stations, regardless of the fact that the line currents are being continually neutralised, so that practically no current flows between A and B, and that they are operated sometimes by the line current and sometimes by the compensation current. Thus, while A sends messages to B, B can be sending messages to A upon the same wire and at the same time.

We assumed that the line current received at A from B was exactly equal to that proceeding from A to B, and that therefore they were exactly neutralised, but it is not so in practice, for owing to the effects of bad insulation the incoming line current is always weaker than the outgoing one. Hence the current received at A from B does not neutralise the whole of the current sent from A to B, but only a portion of it. It so weakens A's current to line that the compensation current preponderates over this resultant current, and the signals are registered by the preponderance. The difference in the strength of these two currents when both stations are working is very nearly equal to the strength of the current received at A when B alone works, so that the marks, whether made by the received line current or by the preponderating compensation current, are practically the same.

We have shown in the diagram that the same poles of the battery are to line, and that therefore the line currents flow in opposite directions; but the same effects occur if the opposite poles are to line, and the currents flow in the same direction. If the current from B flows in the same direction as that from A, the effect, when the two stations work simultaneously, is not to weaken the resultant current, but to strengthen it, and therefore to produce a preponderance of the current in wire *l* over that in wire *r* of relay E, and consequently to register signals; but in this case the marks made at A when both stations are working simultaneously are not made by the preponderance of the compensation current over the line current, but by the excess of the resultant line current over the compensation current.

There are certain irregularities in the working of such a system in actual practice which have to be provided against, due to variations in the resistance and in the electrostatic capacity of the line. Telegraph wires, in fact, are in a constant state of change. If A and B be connected together by an aerial wire supported at intervals of about 80 yards upon porcelain insulators, then the current which arrives at B from A must necessarily be less than that which leaves A, because at each pole a small portion of the current escapes or leaks to earth. No porcelain support is an absolute insulator. Moisture is deposited upon its surface. The amount of this moisture continually varies, and the resistance of the insulator to the leakage of the current varies with it. Hence the difference between the current leaving A and that arriving at B is constantly varying, and the effect upon the current leaving A is precisely the same as if the

resistance of the line varied. If moisture be abundant more current leaves A, and the effect at the sending end is the same as if the resistance of the line-wire were reduced, but of course the increased current is not received at the other end. If the insulators become dry, less current leaves A, and the effect is the same as if the resistance of the line were increased. In fact, the resistance of the circuit does vary with the amount of moisture deposited on the insulators, and with the amount of dirt which necessarily adheres to them. Rain, fog, dew, and mist affect it. Lines exposed to the spray of the sea or the smoke of manufactories are peculiarly liable to this variation. Other causes also introduce irregularities which interfere with the constancy of a line. The wires are continually subject to accidents of various kinds, many of which tend to produce variable resistance.

Now what effect has this variation of the resistance of the line-wire upon duplex working, and how is it provided for? Clearly it disturbs the equality of the line and compensating currents, and causes the one to preponderate over the other; and if no means were adopted to compensate for this variation, duplex telegraphy would be impossible. Therefore the resistance in the compensation circuit is not made a fixed quantity, but consists of a series of resistance coils, by which the resistance of the compensation circuit can be varied in consonance with the variation of the line circuit. This instrument is called a *Rheostat*.

The compensation current is then adjusted by the aid of a *differential galvanometer*—i.e. a galvanometer double-wound in the same way as the relay coils, the line current passing through one coil and the compensation current through the other in the opposite direction. Thus, when the compensation circuit is properly adjusted, the outgoing current will produce no effect upon the galvanometer.

Another modifying influence present on a telegraph line is *electrostatic capacity*—i.e., in brief, the power which it has of retaining or accumulating a portion of any current passing in it. This also has to be properly represented in the compensation circuit, and this is done by means of *condensers*. This is a term applied in electricity to an apparatus generally composed of alternate layers of tinfoil and paraffined paper (or mica), so arranged and connected as to form virtually a flat Leyden jar of large surface. As the capacity of a telegraph line varies with weather and from other causes, the condenser is also made variable.

It will be seen that satisfactory duplex working demands more skill and attention from the operators than does ordinary working; hence, as there are always times during which the requirements of business do not render it necessary that a circuit shall be worked duplex, all duplex circuits are fitted with switches, by means of which recourse may be had to ordinary working, still using the same apparatus.

(8) *Quadruplex System.*—Duplex telegraphy, as explained in the last section, means the transmission on the same wire of a message from (say) station A to station B while B is sending another message to A. If A or B be able to send *two* messages to the other at the same time on the same wire we have *diplex* telegraphy; by combining these two systems—duplex and diplex—we may have four messages, two in each direction, being sent simultaneously on a single wire, and this constitutes *quadruplex* telegraphy.

Suggested by Stark and Bosscha in 1855, it was not until 1874 that the problem of quadruplex working was solved by a device of Thomas Alva Edison, and the system now in use is the result of his efforts, supplemented by the work of Prescott, Gerritt Smith, and others. It may be broadly described as the duplex system provided with two keys in the sending circuit, and two relays, each having a coil in both the line and the compensation circuits (*l* and *r*, fig. 6). One key (on the A side of the set) is so connected that when its lever is depressed the battery connections are reversed, so reversing the direction of the current; while the other key (on the B side) is so constructed that the depression of the lever brings into circuit three times as much battery power, so that (whatever the direction of the current) it is increased in strength threefold. The A side relay at the other end is polarised, and responds correctly to the 'marking' and 'spacing' currents whatever their strength, while the relay on the B side is non-polarised, and is actuated only when the greater current is received, and then responds whether the current is 'positive' or 'negative.' With the earlier methods of working, an uprighting sounder was used with the non-polarised relay on the B side for the purpose of translating the signals on the local sounder; and this, due to the action of the distant A key, was liable to give rise to kicks in the B sounder and cause difficulty in working. This difficulty has been overcome by the substitution of a condenser arrangement in place of the uprighting sounder. The quadruplex system is now giving way to the multiplex type-printing systems referred to below.

(9) *Wheatstone Automatic.*— The several kinds of apparatus already described are dependent entirely upon the hand for the transmission of the signals, and this necessarily limits the possible speed of transmission. Even the sounder cannot be worked by the most expert of operators at a rate exceeding forty-five words a minute. This is, however, by no means the limit of speed at which signals can be recorded even by the simple Morse recorder. Early efforts were made to replace the hand-worked key by some mechanical contrivance which would not only remove the defects inherent to manual labour, but would secure precision in the formation of the characters, accuracy in the despatch of messages, and speed in transmission. Bain in the year 1846 was the first to propose this. He punched broad dots and dashes in paper ribbon, which was drawn with uniform velocity over a metal roller and beneath styles or brushes of wire, which thus replaced the key, for whenever a hole occurred a current was sent by the brushes coming in contact with the roller. The recording instrument was his chemical marker. The speed at which messages were transmitted at experimental trials was enormous; 400 messages per hour were easily sent; but when to the defects in the machinery were added the disturbances on the line from causes which were then unknown, it failed to commend itself. Perhaps the real reason for its not being persevered with was that at that time the amount of traffic on any line was not sufficient to require the use of so fast working an instrument.

Wheatstone's system of automatic telegraphy is that which is used in England. Bain's method of punching has been considerably modified, and the messages are recorded on an exceedingly delicate form of direct ink-writer. The apparatus consists of three parts: the *Perforator*, by which the message is prepared by punching holes in a paper ribbon; the *Transmitter*, which sends the message under the control of the punched paper; and the *Receiver*, which records the message at the distant station when thus sent by the Transmitter.

The *Perforator* consists of three levers or keys the depression of which actuates five punches in a certain order, and also a groove and a feed arrangement to guide and move forward the paper as it is

punched. The paper used is of a white description dipped in olive-oil. The three keys on being depressed drive the punches through the paper, cutting out clean round holes. The depression of the left-hand key causes the paper to be perforated with three holes in a vertical line thus: o ; the depression of the centre key punches one—centre—hole only, thus: o; and the depression of the right-hand key perforates four holes arranged thus: oo. The left-hand key corresponds with dots, the centre with spaces, and the right-hand with dashes. It will be noticed that the holes made in the centre of the slip are smaller than those in the upper and lower rows. They admit the teeth of a little star wheel, which is turned through a small space whenever one of the keys is depressed, and which thus moves the paper forward a certain distance for each depression of either key by a species of rack and pinion movement. The space through which the paper is moved for a dash is twice the length of that through which it is moved by either of the other keys. In fact two central holes are punched for each dash required, and the star wheel is made to turn two teeth instead of one as in the case of the other two keys. If left, right, and centre be struck or depressed in succession, we have the paper prepared for the letter A; if right, left, left, left, and centre be depressed in succession, we have the paper prepared for the letter B; and so on for all the letters and signals. The word *Paris* thus prepared is indicated by fig. 7. An expert

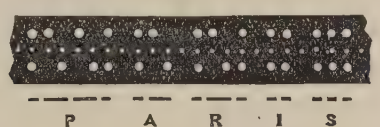

Fig. 7.

operator can punch at the rate of about forty-five words per minute, but the average rarely exceeds forty.

The *Transmitter* replaces the key of the ordinary apparatus, and it sends the currents by mechanical means under the control of the punched paper; hence the name of the system—the Automatic.

The arrangement of the parts is such that when running free the electrical portion sends alternate reverse currents of short duration, but when the slip is inserted these reversals are interrupted by means of the action of vibrating pins which tend to pass through the upper and lower holes of the slip. Thus, to take the first letter of the slip shown above: the transmitter would be sending a spacing current when the back pin would rise through the first upper hole and permit a reverse (marking) current to be sent. On the next rising of the front pin it would pass through the first lower hole, and the reverse (spacing) current would pass. Thus a 'dot' would have been sent to line. The spacing current would remain on (for a period equal to the length of a dot) until the back pin again rose through the second upper hole, when the marking current would again be to line. When the front pin again rose its progress would be stopped by the slip, as there is no hole in the lower row beneath the second upper hole, and therefore no reversal would take place; the same applies also to the next rising of the back pin, and the marking current would therefore remain on until the occurrence of the second lower hole permitted a reversal; thus the second signal would be three times as long as the first—the proper respective lengths of a dot and a dash—and so on with the other signals and spaces.

The *Receiver*, by means of which the signals sent by the transmitter are recorded, is a direct ink-writer of a very sensitive character. The slip is drawn forward between two rollers by means of a train of wheels driven by a large weight. Before passing between the rollers the slip is brought near to a small inking disc which is rotated when the clockwork is in motion. The instrument is regulated by a fly to maintain uniform speed, and this fly is so arranged that by means of a lever the speed of slip can be adjusted to suit recording at any speed between 20 and 450 words per minute. The light marking disc is fixed to an axle geared with the clockwork, and rotates close to the periphery of a larger disc that moves, in the reverse direction, in a well of ink. This latter disc takes up the ink and feeds the marking disc by capillary attraction without introducing friction.

Passing now to the electrical arrangement of the receiver, the electro-magnets which work the recording armature consist of two bobbins of fine silk-covered copper-wire, having cores of carefully annealed soft iron. If these cores were provided with a cross-piece they would form what is generally known as a horseshoe-shaped electro-magnet; but less electro-magnetic inertia and greater rapidity of action are obtained by dispensing with the cross-piece and providing a second armature at the lower end of the axle, polarised in the opposite direction to the upper armature by means of the other pole of the inducing magnet. The arrangement is, in fact, similar to that shown by fig. 4. The *working* speed which can be attained by this system is about 400 words per minute, but in actual practice it is not usual to run at a higher speed than about 180 words a minute. Both transmitters and receivers can be driven either by a weight or an electric motor. An English telegraphic 'word' is taken to be twenty-four reversals on the transmitter. The 'Creed' type-printing apparatus described in the next section is now frequently used in place of the receiver.

(10) *Type-printing Systems, including Multiplex Telegraphy.*—By far the greatest advances in telegraphy in recent years have been in the development of type-printing systems. Many ingenious devices have been made in order to produce the received messages in plain printed characters. (Fig. 8 is a fac-simile of a piece of slip printed by

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Fig. 8.

means of the Hughes type-printer.) Some have not been able to survive the test of service conditions, and have fallen into disuse. The systems which are now in use may be divided into two classes—viz. those suitable for heavy and those for light traffic. The former may be further subdivided into those systems which operate on the multiple-channel or *multiplex* system, and those which operate at high speed on a single-channel circuit. The multiplex systems include the *Baudot*, the *Murray*, the *Western Union*, and the *Western Electric*. The high-speed single-channel systems are the *Creed* and the *Siemens Automatic*. Among the light traffic systems may be classed the *Hughes*, the *Morcrum* 'Teletype,' the *Western Electric* 'Start-stop,' and the *Creed Direct Printer*.

Multiplex Telegraphy.—In 1873 Meyer conceived the idea of so arranging two corresponding sets of apparatus at distant places that, by causing them to move in exact synchronism, the use of a telegraph line might be given successively to several

operators for a very short period of time, so that one at each end would have it alone during the recurring periods. The synchronous movement of the two sets would ensure that each operator at one end should always have communication with the corresponding operator at the other. The principle, indicated in fig. 9, is as follows. If the

Fig. 9.

arms, *a*, *b*, which are electrically connected with the line-wire at A and B respectively, be made to rotate simultaneously around the circles 1, 2, 3, 4, making contact with the segments as they pass, then when *a* is on A1 *b* will be on B1, when *a* is on A2 *b* will be on B2, and so on. Again, if 1, 2, 3, 4 at each station be connected to a set of telegraphic apparatus (say a type-printing instrument), then each of the four sets at A will be successively connected with the corresponding set at B as the arms, *a*, *b*, move over the segments 1, 2, 3, 4. Thus, for each revolution of the arms, the instrument connected to A1 and B1 will be in direct communication once, and so also with A2, B2; A3, B3; and A4, B4.

Various methods of multiplex working have been tried, but the most practical and successful system now in use is the *Baudot*, named after the distinguished French telegraph engineer, who first introduced it about 1880. It is largely in use throughout the world, either in its simple form with hand keyboard transmitters, or in the modified forms in which it has been introduced by Donald Murray, the Western Union Telegraph Co., and the Western Electric Co. of America. The system uses a special 'five-unit' code, in which various combinations of five positive and negative currents are made, in place of the dot and dash signals of the Morse code. All the letters are of the same length. The system can be arranged for two (double), three (triple), four (quadruple), five (quintuple), and six (sextuple) channels, and it can in each case be worked duplex, thus giving the same number of channels in each direction simultaneously. With the Baudot sextuple, for instance, twelve messages (six in each direction) can be sent out at the same time over a single wire. The Post-office has several sextuple and quintuple circuits in daily operation, but the set more generally in use is the quadruple.

With the quadruple system each station requires a distributor, three relays, four keyboard transmitters, and four tape-printing receivers. The distributor and relays are common to all the keyboards and receivers at the one end of the wire. Each keyboard has five keys resembling those of a piano; each key is connected to one segment on the distributor, and, when in the position of rest, transmits a negative current to the line as the rotating brush passes over its segment. Depressing a key causes a positive current to flow to line. The keys, when depressed, are held down by a mechanical catch until the rotating brush has passed over their set of segments. At this moment a local current, called the 'cadence,' flows through an electro-magnet, whose armature releases the keys and at the same time gives a signal to the operator to manipulate the keys for the next group of signals. On the keyboard is mounted a commutator for altering the various connections for sending or receiving. The distributor is fitted with two ebonite discs of equal size. The front disc is used for receiving and the rear one for sending. Mounted on both discs are six contact rings; two rings on each disc are continuous, but the remainder are broken up into insulated segments of various sizes. A set of arms carrying brushes rotates over each disc; the set on the front disc has two arms carrying two pairs of brushes, while the set on the rear disc has three arms, each carrying a pair of brushes. When transmitting, the keys send the currents to their particular segments on the rear disc, from where they are connected to line through the 'line' relay. If desired, a 'leak' relay is also actuated, by means of which the signals are transmitted to a local receiver and recorded. Received signals flow in through their connections on the back disc, and thence through successive segments, keys, &c., to the 'line' relay. The tongue of this relay transmits corresponding impulses to the proper position on the front disc, and thence through the segments to the magnets of the receiving instruments. The rotating arms can be driven either by a weight or by an electric motor. Synchronous running is maintained through various contacts on the rings of the correcting distributor being periodically connected to the correcting magnet. The receiver is of most ingenious design, and it is at the same time of strong and robust construction. It is driven at a speed corresponding with that of the distributor. It consists essentially of five electro-magnets, the armatures of which, when attracted, actuate certain mechanical selectors; and these again, by a somewhat intricate combination of electrical and mechanical movements, bring the tape against the required letter on the type-wheel, and thus a letter is printed on the tape. The normal speed of the Baudot is 30 words per minute per operator. On a sextuple circuit-worked duplex it is, therefore, possible to transmit 360 words per minute. The system is remarkably flexible, inasmuch as, dependent upon the traffic, any number of channels up to the total number available can be operated, and channels can be closed down as the number of messages to be transmitted diminishes. The system is therefore eminently adapted for handling heavy traffic. It can also be extended, and forked circuits can be arranged. For instance, in the case of a quadruple set at A, two channels can be worked to B, while the two other channels can be extended to C, thus giving A communication with B and C over the same wire.

Murray Multiplex.—This system was evolved by Donald Murray, and brought into use in England in 1911. It is the Baudot system described above, with certain modifications, which make for an increase of working-speed. In place of the five-key hand-sender on each channel, a keyboard perforator similar in form to a typewriter is employed to prepare a paper tape, which is passed through a simple type of transmitter. The perforations are produced across the tape instead of lengthways as in the case of the Wheatstone Automatic system, the result being a great economy of tape. Perforated in this manner, a slip containing 120 letters (20 words) is only 12 inches in length. The speed per channel is really only restricted by the speed of the operator in manipulating the typewriter keyboard. Speeds up to 45 words a minute per channel are quite usual on this system, and with specially selected operators speeds up to 60 words a minute may be attained. The distributors employed are of the Baudot type, but Murray has introduced a new form of drive for the brush-arms by means of a phonic wheel and vibrator, which has advantages in maintaining the synchronism of the two distributors. This method of drive can be adapted to the ordinary Baudot system. For receiving the signals at the distant end, Murray uses various types of printers, the chief of which are the Baudot

tape-printer and the Morcrum tape-printer and page-printer. Another feature of the Murray system is that in the case of a message to be retransmitted, the sending station can, by means of a special signal, switch a receiving perforator into circuit, which perforates the signals on a tape. This tape can be run through a transmitter on another circuit, and so the work of transcribing the message and preparing it by hand for retransmission is obviated.

Western Union Multiplex. — Murray sold his American rights in the Murray Multiplex to the Western Union Telegraph Co. of America in 1912, and this company, assisted by the Western Electric Co., designed and brought into use on the telegraph company's lines multiplex apparatus adapted for the conditions and requirements of the country. The system has been largely introduced in the United States. It comprises perforators and tape transmitters, and in a general way follows the lines of the Murray Multiplex, although several new features have been added. The receiver is a page-printer, which is operated chiefly by electro-magnets and relays. The four-channel (quadruple) set is the largest in use, and this can be worked duplex.

Western Electric Multiplex.—This system follows the general design of the Western Union apparatus, but differs in a number of important details. It is in use in the British Postal Telegraph Service. The page-printer which is employed with the Western Union system is a feature also of this system.

Creed Automatic.—This is a high-speed single-channel system using the Morse code. It was invented by F. G. Creed in 1908. It is used in the British Post-office in conjunction with the Wheatstone Automatic (see above); but transmitters, together with keyboard perforators and other auxiliary apparatus specially designed by the Creed Company, are used in other directions. The essential parts are a receiving perforator and a printer. Originally compressed air was employed for actuating the punching and printing mechanisms of those machines, but in the latest designs they are both actuated electrically. The receiving instrument perforates the signals in the Morse code on a tape identical with the punched tape used at the transmitting end. This tape is then passed through the printer, which transposes the Morse code perforations into Roman characters, and prints these either on a tape or, by means of a special attachment, in column form. It is claimed that the receiver will operate accurately up to a speed of 200 words a minute, while the safe working-speed of the printer is about 140 words a minute. The system can be worked duplex. It is used to a considerable extent on newspaper circuits in Great Britain and on submarine cables, and is being employed on high-speed services in Wireless Telegraphy (q.v.).

Siemens Automatic.—This system, introduced by Siemens and Halske of Berlin in 1914, is in use in the British Post-office on a line between London and Berlin. It is worked duplex at a speed of 160 words per minute in each direction. It employs a five-unit code, and embodies the Baudot principles of synchronism by means of a distributor at each end. A keyboard perforator prepares a tape, which is passed through a transmitter. This sends current to line through the distributor-brushes and line relay. At the receiving end these currents actuate the line-relay, which brings local currents into play through the receiving distributor-brushes, which move in unison with those of the distributor at the sending end. These local currents control the relays of the printer, and at the right moment cause a paper tape to be pressed against the required letter on the type-wheel, which carries the letters on its rim.

Hughes Type-printer.—This system is a slow-speed single-channel one. It was brought out in 1855, and embodied principles which had not previously been introduced. It was further improved, and has for many years past been the principal instrument used on submarine cables connecting England with the Continent. It is also employed to a considerable extent in continental countries. The instruments at the sending and receiving ends are identical in construction, and synchronism is maintained by a cleverly designed 'governor.' The action is principally mechanical, the electrical part being confined to the transmission and reception of a single current of short duration for each letter or other sign registered. The sending portion is like a piano keyboard, with the letters and other symbols engraved upon the keys. The mechanism is stable and accurate in operation, although complex in character, and the operators entrusted with its working are required to be specially skilled. The system can be worked duplex, and a speed of about 30 words per minute each way is attained. Its use is not likely to be extended, as to cope with increasing traffic the employment of apparatus of larger output is necessary.

Morcrum 'Teletype.'—This instrument is made in two forms, one for tape-printing and the other for page-printing. The former comprises a keyboard transmitter and a tape-printer mounted together on the same base. A five-unit code is used, and the instrument when receiving is automatically started and stopped by impulses sent out by the sending station. These impulses also ensure synchronism between the printing mechanism and the transmitter. The instrument is specially adapted for use on private lines, and on public telegraph lines on which the traffic is not too heavy. The printer can be supplied as a separate unit. The page-printing machine is also in two units, mounted together where both transmission and reception are required. The system can be worked duplex, and in skilled hands a speed up to 60 words a minute can be attained in each direction. The Morcrum page-printer as a separate unit can also be used for reception on multiplex systems.

Western Electric Start-stop. This system, introduced by the Western Electric Co. of America, is suitable for circuits not requiring a greater traffic-carrying capacity than 60 words a minute in each direction. Transmission is performed either directly from a keyboard or by means of a perforated tape and a simple form of transmitter. In fundamental principles the system is similar to the company's multiplex system referred to above, and uses the same five-unit code and some of the same apparatus units. The 'Start-stop' functions are accomplished by current impulses controlled by the sending keyboard.

Creed Direct Printer.—This instrument has a keyboard mechanism for sending, and the received signals are produced on tape or in column form as desired. It is worked on the five-unit principle, and is capable of being operated at a speed up to 70 words a minute. It can be duplexed.

Other type-printing systems are in use by various private news agencies, and in these cases the apparatus must be relied upon to work without expert attention, or, indeed, any attention except that given for maintenance purposes at regular intervals. These systems generally require a current for every step forward of the type-wheel. One very interesting system is that of the Exchange Telegraph Company of London, which distributes news to many different points simultaneously, where it is printed on a paper tape. The speed of working with a skilful operator reaches 40 words per minute. This company also employs a column-printer, invented by their chief engineer,

Mr F. Higgins. It has many ingenious features, and was the first column-printing instrument to be brought into successful commercial use. Other instruments associated with type-printing telegraphs are the 'Gell' and the 'Kleinschmidt' keyboard perforators, which perforate tape in the Morse code. Both are used in the British Post-office.

(11) *News Circuits.*—Wheatstone automatic instruments are employed on nearly all long circuits in England, not only because they increase the capacity of the wires for the conveyance of messages, but because they are so specially adapted for the conveyance of news, which is such a distinctive feature of the English system of telegraphy. One batch of news is often sent to a great many different places, and as four or even eight slips can be prepared at one operation, and one slip can be used several times, the labour of preparing for transmission is very much reduced. In fact, without this system it would be simply impossible to transmit the enormous amount of intelligence sent telegraphically all over the country. There are many news circuits radiating from the Central Telegraph Station, having three and four intermediate stations upon them, one or more of which 'repeat' or 'translate' onward to three or four more stations. Thus one punched slip disseminates the news to many places. A large proportion of the news items handed in by news agencies has to be sent to addresses in all parts of the country, and to effect this the slip once prepared can be used over and over again upon different circuits; moreover, by means of pneumatic power, the perforators at the Central Telegraph Office are capable of punching four slips at a time, and, the pneumatic instruments being arranged to work several perforators, a proportionate number of slips are thus prepared at one operation. Not only can one slip be used upon several different circuits, but often several offices which generally take the same class of news can be placed upon one circuit, so that all take the same messages simultaneously. When an address is outside the delivery of a news circuit the message may have to be received, written up, and again transmitted, or it may be retransmitted by means of a perforated tape prepared by a Creed perforating receiver. The Creed system is also much used for receiving on news circuits, as the printing of the signals saves time and labour in writing out the news by hand. The Press Association News Agency of London has now its own system for the transmission of news to a number of provincial newspapers. The wires employed are provided by the Post-office on a rental basis, and the apparatus used is the Creed. The handling of this work by the Press Association has relieved the Post-office of almost 50 per cent. of the press-work previously dealt with by the department. Press messages are carried by the Post-office at a low tariff, especially during the night. To save delay and secure the transmission of their news at a fixed rate, many of the provincial newspapers arrange for the sole use of a wire during the night. Some of the London papers have special wires to the Continent. Practically all newspaper wires are now worked by one form or other of type-printing system, the Creed and the Murray Multiplex being most favoured on lines carrying heavy traffic. The Teletype is also used for this purpose.

(12) *Repeaters.*—The length and description of a circuit have a great deal to do with the possible speed at which it can be worked. The greater the distance, as a rule, the lower the speed, and the reducing effect of a mile of underground wire is greater than 20 miles of aerial line. But even with an aerial line the leakage, &c. at the insulators makes the strength of current received, as compared with that sent out, proportionally less as the distance increases; and although it is of course possible to compensate for this loss by an increase of battery power, it is not so easy to compensate for the retardation due to electrostatic capacity. In dry climates the limit of distance for uninterrupted communication is rarely reached in practice, but in England the conditions are such that 400 miles may be taken as the limit. It then becomes necessary to take off the messages and repeat them by clerks, or to introduce a *repeater* or *translator* which, worked by the original currents, will automatically transmit or relay stronger currents similar in direction to, and of equal duration with, those which are passed through it. It is, in fact, an extension of the principle of the ordinary relay, and is introduced into the circuit for a similar reason—the relay is placed in circuit that it may be actuated by currents which would not work the sounder or Morse writer direct, and completes a local circuit in which the receiving apparatus is placed; the repeater is also arranged to relay similar currents to those which actuate it; but while the relay as ordinarily used is required to work an instrument in the same office, the prime function of the repeater is to retransmit the signals along an extension of the original line. By this means it is possible to work to any distance. Thus the Indo-European line from London to Karachi in India, a distance of 5300 miles, is worked directly (without any retransmission by hand) by means of fourteen repeaters.

Varley introduced repeaters at Amsterdam to translate the English double-current system of working into the Continental single-current system in 1858, but in England the Post-office has introduced them to increase the rate of working. There is, however, a limit to the number of repeaters which can be employed on one line. The motion, friction, and inertia, both magnetic and mechanical, of the moving parts, and the introduction of disturbing electrical causes, prevent the duration of the contact of the tongue of the relay from being the exact counterpart of that of the sending key. It is of less duration. Retardation therefore takes place, and the rate of working is reduced with each relay added. In few cases in England is more than one repeater introduced, but by means of that an actual and decided increase of speed is obtained, due to the fact that the speed of working of the whole circuit is made that of its worst section alone. With the placing underground of the long-distance lines and the introduction of the Creed perforating receiver on the Wheatstone Automatic circuits, the speed of working on these lines has been very much reduced. Instead of 400 words a minute, which was formerly the regular speed on these circuits, 130 to 200 is now the rule. At these speeds the use of repeaters is still required. It is impossible, however, in this article to give a correct idea of the working details of the repeaters now used.

(13) *Submarine Telegraphy.*—Owing to the retarding influence of a long submarine cable, by which it becomes difficult to pass ordinary electric currents through the cable except at very long intervals, giving the cable meanwhile time to discharge, and owing also to other disturbing causes, special means have to be adopted in working such cables in order to obtain the maximum possible speed. The method usually adopted was invented by C. F. Varley, and consists in interposing a condenser in the receiving circuit, so that instead of the circuit being complete it is interrupted at the condenser; and the instrument—a very sensitive form of galvanometer devised by Lord Kelvin—is actuated merely by the charge and discharge of the condenser. The Thomson galvanometer, without which long cables could scarcely have been commercially successful, consists essentially of a magnet

composed of one or more pieces of a watch-spring, ⅝-inch in length, cemented upon a small circular convex mirror of silvered glass, which is suspended by a short thread of cocoon silk without torsion. This needle is suspended in the centre of a coil of very fine wire, and a ray of light is projected from a lamp upon the mirror. The beam of light is reflected at some distance upon a scale, and a very minute movement of the mirror therefore produces a considerable movement of the ray projected upon the scale. The movements of the spot of light upon the scale are read off in precisely the same way as the motions of the pointer on the dial of a single-needle instrument. The ordinary Morse system on an Atlantic cable could scarcely have a speed of one word a minute, while fifteen words was soon a usual speed with the reflecting galvanometer, and twenty-four was obtained. By Lord Kelvin's Syphon Recorder (1867) cable messages can be permanently recorded as on the Morse system.

With improved methods much higher speeds are now obtained. The speed attained on the London-Halifax section of the Imperial cable is thirty-five words a minute in both directions. The Morse signals received on many cables are converted into Roman characters, and printed on tape by means of Creed apparatus. The most remarkable feat on record in cable transmission occurred at the opening by the king of the Wembley Exhibition on the 24th April 1924. The king's message: 'I have this moment opened the British Empire Exhibition, George R. and I.,' was signalled from the telegraph office at the exhibition round the empire from west to east, involving seventeen transmissions in all. On the outward journey it passed through Halifax (Nova Scotia), Montreal, Bamfield (Vancouver), Fanning Island, Fiji, Auckland (New Zealand), and Sydney. From this point it came back by two routes, one touching Cocos, Rodriquez, Durban, Capetown, St Helena, Ascension, St Vincent, and Madeira, the other touching Singapore, Madras, Bombay, Aden, Suez, Alexandra, Malta, and Gibraltar. The time taken in transmitting this message round the world was eighty seconds.

Submarine cables naturally vary considerably in construction, but the following are the general principles. For deep-sea cables, the central conductor, to carry the current, is usually of several strands of fine copper wire; this is enveloped in a thick coating of insulating material, generally gutta-percha; next, a layer of jute yarn, which is covered by a spiral layer of iron or steel wires; and finally, a covering of jute yarn coated with pitch. In shallow water an extra outside covering is applied, and 'shore ends' are made still stronger owing to the increased risk of damage.

During the Great War a cable connection was established between Penzance (Cornwall) and Halifax (Nova Scotia), thus completing the Imperial chain of cable communication between London and the Antipodes.

See, besides the articles ELECTRICITY and WIRELESS TELEGRAPHY, T. E. Herbert, *Telegraphy; British Post-office System* (1920); Preece and Sivewright, *Telegraphy* (1914); and C. Bright, *Submarine Telegraphy* (1898).

Telegraph Plant (*Desmodium gyrans*), an Indian leguminous plant. Of its trifoliate leaves the lateral leaflets, which are small, have, especially in a warm, moist atmosphere, a strange spontaneous motion; they jerk up and down (sometimes 180 times in a minute), as if signalling, and also rotate on their axes (see PLANTS, p. 208).

Tel el-Amarna, &c. See TELL EL-AMARNA, &c.

Tele'machus, son of Ulysses (q.v.) and Penelope, was an infant when his father left home to join in the war against Troy, but during his twenty years' absence grew into manhood. Under the guidance of Athene, who had assumed the appearance of Mentor (q.v.), Telemachus set out in search of his long-lost sire, after having vainly endeavoured to eject his mother's troublesome suitors from the house. Having visited Pylos and Sparta, Telemachus returned home to Ithaca, where he found his father in the guise of a beggar, and with him proceeded to slay the suitors.—In modern times Telemachus is known chiefly as the hero of Fénelon's romance, once very popular as a school-book.

Telemark, an administrative district of southern Norway, with an area of 5860 English sq. m. and a population of 125,000. It rises from a coastal plain to an upland region, attaining a height of 6000 feet at one point (Gausta). It is dissected by numerous large and beautiful lakes such as the Nordsjö, Bandaksvand, Totakvand, Nisservand, Fyrisvand, and Tinsjö. Capital, Skien.

Teleology (Gr. *telos*, 'an end'), the doctrine of final causes (see CAUSALITY), is usually limited to the argument for a creator and for the existence of God derived from the existence, beauty, and perfection of the world; the *a posteriori* argument of Apologetics (q.v.). See also THEISM.

Teleosaurus, a genus of fossil crocodiles, the remains of which occur in the Lower Jurassic rocks. They are found associated with marine fossils, and the peculiar modification of their skeleton seems to have specially fitted them for an aquatic life. Both surfaces of the vertebræ were slightly concave, the hind-legs were large and strong, and the anterior portion of the body gradually tapered into the long and slender jaws, giving the animal the aspect of the gavial of the Ganges; but the jaws were more attenuated, and the nasal aperture, instead of being oblique, opened vertically on the truncated end of the upper mandible. The jaws were armed with numerous equal and slender teeth, slightly recurved.

Teleostei. See BONY FISHES.

Teleostomes. See FISHES (*General Survey*).

Telepathy, a word coined about 1882 from the Greek to express the supposed power of communication between one mind and another by means unknown to the ordinary sense-organs. See the article APPARITIONS, and books cited there.

Telephone. This instrument is designed to reproduce sounds at a distance by means of electricity. Sound is due to vibrations of the air, and these vibrations differ among themselves in, and are characterised by, three particulars—viz. frequency or number per second, amplitude or range of displacement, and co-existence of simultaneous vibrations affecting the same air. These physical data determine respectively the pitch, the loudness, and the character, quality, or *timbre* of a sound. The mechanical problem of telephony then is, given an air-vibration which presents these three characteristics in any determinate way, to reproduce a similar air-vibration at a distance; then this, being received by the ear, will be perceived as sound. Under the most complex vibration no particle of air can be in more than one place at once: hence the net result of superposition of the most complex possible series of vibrations, from single melody or smooth harmony to the most complicated noise or the most delicate inflexion of the human voice, is a movement of each air-particle which may be represented by a curve of an apparently irregular form, lying alternately above and below a straight line which threads the curve and represents the position of the air-particle when undisturbed. The reproduction of this irregular resultant motion is the most general form of the problem: the earliest attempts were confined to the reproduction of the frequency of a vibration—i.e. the pitch of a sound,

the first of the particulars above mentioned. In 1860 Reis of Frankfort first attacked the problem: he used a collodion membrane, upon which the sound-waves produced by the voice were made to impinge; this membrane, vibrating under their influence, alternately displaced and liberated a lever, which alternately made and broke the circuit of a galvanic battery; the intermittent current thus produced acted upon a distant electro-magnet which alternately attracted and failed to attract its armature; the armature thus oscillated, and a wing or plate attached to it acted upon the air, which was thus set in vibration, reproducing the pitch of the original tone or the inflection of the original voice. It appears from recent inquiry that Reis actually did more than this; but the next step is attributed to Mr Elisha Gray of Chicago, who sent successions of electrical current of varying strength as well as of varying frequency into the circuit, and thus enabled the relative loudness as well as the pitch of sounds to be transmitted; and who afterwards took the important step of using the variations of a steady current. These variations, positive and negative, are capable of representing all the back-and-fore variations of position of a particle of air, however irregular these may be: and he secured them by making the sound-waves set a diaphragm in vibration; this diaphragm carried a metallic point which dipped in dilute sulphuric acid; the deeper it dipped the less was the resistance to a current passing through the acid, and *vice versâ:* so that every variation in the position of the diaphragm produced a corresponding variation in the intensity of the current: and the varying current acted upon a distant electro-magnet, which accordingly fluctuated in strength, and in its attraction for a piece of soft iron suspended on a flexible diaphragm: this piece of soft iron accordingly oscillated, pulling the flexible diaphragm with it; and the variations of pressure in the air acted upon by the diaphragm produced waves, reproducing the characteristics of the original sound-waves, and perceived by the ear as reproducing the original sound or voice. Mr Gray lodged a *caveat* for this contrivance in the United States Patent Office on 14th February 1876; but on the same day Professor Alexander Graham Bell filed a specification and drawings of the original Bell telephone. In this the flexible diaphragm upon which the sound-waves impinge bore a small bar-magnet, which was thus made to oscillate; it oscillated in the immediate neighbourhood of the pole of an electro-magnet round which passed the continuous current of a battery; the oscillation of the bar-magnet in the neighbourhood of the pole caused fluctuations in the strength of the electro-magnet; these fluctuations caused variations in the intensity of the current passing continuously round the electro-magnet, and away to the distant receiver; there the varying current found an electro-magnet to act upon, and this exerted varying tension upon a soft-iron diaphragm. Later on Bell disclaimed the use of a non-metallic flexible diaphragm in the transmitter, and used only a soft-iron diaphragm; and he also used a permanent magnet instead of an electro-magnet in that instrument, it being found that currents of sufficient intensity were produced thereby. He also used similar instruments at both ends of the line. For these two later modifications priority is claimed on behalf of Professor Dolbear. Mr Edison secured the requisite variations of the current in another way. He found that lamp-black and certain other substances could be prepared in masses which were slightly compressible, resilient, and semi-conductive, and which varied in conductivity as they became exposed to greater or smaller pressures; and that the variations in conductivity were very satisfactorily proportional to the variations of pressure. The vibrations of the diaphragm were accordingly made by him to concentrate themselves upon a small button of such a substance, and thus to induce variations in the conductivity of the circuit.

At the present time instruments of the Bell telephone type are mainly used as receivers only. In the Bell receiver itself both poles of the magnet are now brought into proximity to the magnet; and the instrument may be flattened down into the form of a watch. In the Gower receiver the form is also watch-shaped, and the sound is conveyed to the ear by tubes. In the Ader receiver the electro-magnetic field acting upon the ferrotype iron diaphragm is improved, being rendered more intense and more uniform by a ring of soft iron placed outside the diaphragm. In other receivers devices are applied for economising wire, for decreasing the magnetic resistance of the magnetic circuit, for facilitating construction and regulation, &c. The range of actual movement at the centre of the diaphragm of a receiver is, for the faintest audible sound, less than one fourteen-millionth of an inch. The transmitter is now almost always some modification of the Microphone (q.v.). Edison's instrument, above described, is in substance a microphone; it is, however, not operated by shaking the whole apparatus as in the original Hughes microphone, but by bringing variations of pressure to bear upon the carbon button. In the Blake transmitter the same principle is applied; the current of a battery passes through the button, and is there made to vary, and it also passes through the primary winding of an induction coil: the variations are taken cognisance of by the secondary winding which transmits them, adequately intensified, to the general circuit. The Crossley, the Gower, and the Ader transmitters are more obviously adaptations of the Hughes microphone, with eight, sixteen, and twenty loose contacts respectively instead of two, and attached to the under side of the vibrating diaphragm, which in the Gower and the Crossley is a thin sheet of wood. Other types are the Johnson, which is provided with a shunt so as to adjust the current transmitted, and thus prevent buzzing; the Hunnings, in which powdered coke is used; the Swinton, which depends on swinging carbon rods resting by loose contacts against a carbon bar, there being thus no diaphragm in the popular sense, though the English courts have decided that the carbon rods are mechanically equivalent to a diaphragm; and Thompson's valve transmitter, in which a ball of carbon rested upon three carbon buttons and was impinged upon by air-waves from beneath.

The word 'telephone' is now usually applied to the complete instrument, comprising the transmitter, the receiver, and the various subsidiary appliances, such as switch bells worked by a battery or by a small magneto-electric machine, driven by a crank for signalling purposes. The arrangements which have to be devised for the purposes of a central telephone station increase rapidly in complexity with the number of subscribers. Care must be taken to minimise the effects of induction from neighbouring wires. See Allsop's *Telephones* (1900); Preece and Maier, *The Telephone* (1889); Preece's *Manual of Telephony* (1893); and Miller, *American Telephone Practice* (N.Y. 1899).

Of the five leading telephone patents for Great Britain, the last, the Crossley transmitter, was to expire 1st February 1893. In 1880 (21st December) Mr Justice Stephen decided in favour of the British Post-office that telephony was a form of telegraphy. After that decision telephony was carried on in Britain under the Postmaster-general's license, on payment of one-tenth of the gross receipts. In

1891 this tenth amounted to £40,000, in 1904 to £169,800. France, Germany, Austria, and the Continent generally were well supplied with trunk lines; and in England most of the chief towns were connected directly with London, and there was an increasing number of other lines. The first London-Paris line was opened in March 1891. In Berlin the system of laying wires underground was very thoroughly developed. On the Continent the telephone is largely used by the rural post-offices; and in France any person may telephone from a call-office to a post-office, and his verbal message will be transcribed and sent on as a telegram. In the United States the microphonic transmitter patent only began to run its course of seventeen years in 1891, on account of a dispute as to priority between Edison and Berliner. In 1902–3 the total number of trunk-line conversations in Britain was 11,574,229, and in 1903–4 the number had increased to 13,467,975, and the receipts were £325,525.

In 1892 the Telegraphic Act gave the Post-office entire control of the trunk wires throughout the kingdom. The intention was to provide a complete system of telephonic communication between the important towns, leaving the towns themselves to be dealt with by individual companies. The National Telephone Company, using mostly Blake transmitters and Bell receivers, gradually absorbed the other companies, obtaining a practical monopoly of the work; and it secured a license from the Postmaster-general, which expired in 1911. In 1902 it had 1028 exchanges and 233,000 stations in the United Kingdom. Dissatisfaction having been expressed as to the imperfect service of the National Company, the government in 1898 appointed a select committee, which reported that no system can be satisfactory which is worked under a practical monopoly by a private company for private profit, and that the work should be carried on like the Post-office, for the benefit of the whole country, and not only certain localities and limited areas. They recommended general competition, either by the Post-office or by municipalities acting under license, but favoured the former as promising a more general benefit. The act of 1899 on these lines gave facilities for extending municipal licenses, but these did not come to much. By an agreement dated 2d February 1905 the Post-office acquired the whole undertakings of the National Telephone Company on 31st December 1912, at an arbitration price of £12,515,264. Under Post-office management the system extended fairly rapidly; but from it there were severed the Irish Free State telephones (194 exchanges, 19,037 stations) in 1922, and the Jersey telephones (15 exchanges, 1639 stations) in 1923. At 31st March 1925 there were under the British Postmaster-general 3775 exchanges and 1,273,800 telephones; and during the year there had been 990,000,000 calls. For the numbers in successive years consult the successive volumes of the *Manual of Electrical Undertakings*. Of late years great strides have been made in laying underground trunk cables and in putting in 'automatic' instruments which enable the users to connect by means of an automatic exchange. There are now many cables devoted to Anglo-Continental service, on which there were 822,531 calls during the year ending 31st March 1925. The history of the subject, so far as now traceable, both as regards appliances used and the business matters involved, is well set forth in *The History of the Telephone in the United Kingdom*, by F. G. C. Baldwin (London, Chapman & Hall, 1925). See also WIRELESS TELEPHONY.

Telerpeton, a remarkable genus of fossil reptiles, the relics of which have been found in fine-grained whitish sandstone of Triassic age quarried at Cummingston, near Elgin. A single species, or rather a single specimen, is all that as yet has been detected. It exhibits the skeleton complete, with the exception of the termination of the tail, but the bones have disappeared, and left only the casts as dark-coloured cavities in the pale-gray rock. Nearly perfect casts of their forms were taken by Dr G. Mantell from these hollow casts. Some have regarded *Telerpeton elginense* as one of the Protorosauri, with the New Zealand 'lizard,' Sphenodon, as its only living relative; others refer it to a lost race of primitive generalised reptiles known as Cotylosauria.

Telescope (Gr. *tēle-skopos*, 'far-seeing') usually consists essentially of a lens or mirror, to form within our reach a real image of a distant object suspended in space; and a Microscope (q.v.), to examine this image in detail. Anticipations of the telescope have been claimed for Roger Bacon (died 1294?); and Sir Richard Burton alleges that long ere this it was known to the Arabian scientists (see the supplement to his *Arabian Nights*). Leonard Digges, an English mathematician, very suggestively describes in his *Geometricall Practise* (1571) 'the marvellous conclusions that may be performed by glasses concave and convex, of circular and parabolic forms,' speaks of a separate volume (never published) describing 'the miraculous effects of perspective glasses,' and must be held to have at least anticipated the invention. Della Porta (died 1615) may have made a rude telescope. But the telescope from which all later ones proceed by lineal descent seems to be that presented to the General States of Holland on 2d October 1608 by the optician Hans Lippersheim or Lippershey of Middelburg—though possibly another optician, Zacharias Jansen, and the mathematician Adriaan Metius had also something to do with the development of this same telescope. The value of the invention was immediately realised; telescopes were being sold in Paris next year; and Galileo, hearing of the Dutchman's invention, made a telescope for himself, with which, the first night he used it (7th January 1610), he discovered three of Jupiter's moons. Kepler (1611) is the inventor of the astronomical telescope.

The way in which an inverted real image is formed by a lens is described under LENSES; see also MIRROR. The reason why it is necessary in a telescope to produce a real image which may itself be subjected to examination by means of a lens is the following: If a single magnifying lens, or an equivalent combination of lenses, be placed between a distant object and the eye, the image formed will not be thrown upon the retina itself, and nothing will be distinctly seen, unless indeed the eye is taken far enough back to see the minute real image itself. If, on the other hand, a real image be projected in space within our reach, a magnifying lens or combination of lenses can be made to examine that image as if it were an object, after the fashion of the Microscope (q.v.). If the eyepiece be equivalent to a single magnifying lens or simple microscope, the inverted real image will not appear to be re-inverted, and then what the eye sees on looking through the combination is an inverted magnified representation of the distant object, as in the astronomical *refracting* telescope; but if it be equivalent to a compound microscope, it will appear to re-invert the inverted real image under examination, and will thus furnish an uninverted representation of the object, as in the terrestrial telescope. The astronomical form is thus simpler than the terrestrial, and absorbs less light; and it is accordingly used for sailors' night-glasses. If the real image be formed by a concave mirror, a plane reflecting surface or secondary mirror may be interposed so as to turn back or turn aside the reflected rays before they have

actually formed the real image, and thus to cause the real image to be produced in some place where it can conveniently be examined by a magnifying eyepiece. If the reflected rays be turned aside through 90° by a plane reflecting surface, the magnifying eyepiece will be at the side of the instrument; and then we have the Newtonian

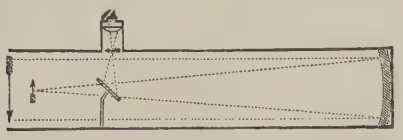


Fig. 1.—The Newtonian Telescope.

form of the astronomical *reflecting* telescope (fig. 1), exemplified by Lord Rosse's telescope. If the reflected rays be simply sent back along the axis of the instrument, they—or the central portion of them—may be allowed to pass through a small hole in the centre of the concave mirror, and dealt with by an eyepiece on the other side of that mirror; in which case we have the Gregorian form of the reflecting telescope (fig. 2), where the eyepiece is at

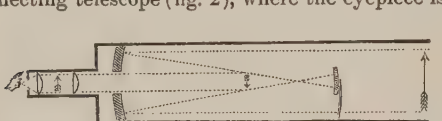


Fig. 2.—The Gregorian Telescope.

the end, as in the ordinary terrestrial telescope. If the concave mirror be tilted slightly to one side it will, without loss of light due to the intervention of a second mirror, itself bring the real image towards one side of the apparatus. There it may be examined by means of an eyepiece suitably placed, directed obliquely towards the mirror; and this is the Herschelian form of the instrument (fig. 3).

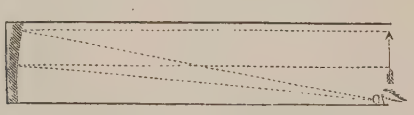


Fig. 3.—The Herschelian Telescope.

These are the three main forms of the reflecting telescope; they are subject to minor modifications, for which see works on practical astronomy.

A telescope cannot be made of invariable length, for two reasons. In the first place, for a given eye there is a fixed, most suitable distance between the eyepiece and the proper position of the real image to be examined by it. Wherever the real image happens to be formed, the eyepiece, simple or compound, must be moved into the proper relative position with regard to that real image; but the image of a nearer object is formed farther from a lens or from a concave mirror than is the image of a more distant object, for which reason the eyepiece of a telescope must be moved farther away from the objective or reflector in order to examine the image of a nearer object; and the telescope as a whole must be lengthened for nearer, or shortened for more distant objects. In the second place, the eyes of different observers may not be similar; each observer may have his own proper fixed distance between the eyepiece and the real image, according to his long-sightedness, short-sightedness, or normal vision. Consequently the distance traversed by the rays between the objective or mirror and the eyepiece is always made adjustable by sliding tubes or otherwise.

When a telescope is in 'focus' a pair of cross-fibres, placed in the focus of the eyepiece, will appear to retain a fixed position with regard to any point of the object as seen through the telescope, even though the eye of the observer be moved up and down or from side to side. This is called the parallactic method of focussing. By substituting for a given eyepiece others of different magnifying powers, the magnifying power of a telescope as a whole may be varied. The magnifying power of a telescope is the ratio between the focal length of the objective and that of the eyepiece. For suppose an object, say a chimney-stalk, 100 feet high at 10,000 feet distance, and the telescope directed towards the bottom of it, the angle subtended by the object, from the point of view of the objective-lens, at the crossing-point of the rays from the top and the bottom of the chimney-stalk, will be a little over 34′, an angle whose tangent is $\frac{1}{100}$. If the objective could be supposed to look backwards and to see the real image produced by it in the body of the telescope, that image would again subtend an angle of 34′, and there would not be any magnification, for the visual angle subtended would be the same. If the image were produced at 1 foot from the crossing-point of the rays, it would have an actual length of $\frac{1}{100}$ foot or $\frac{3}{25}$ inch. But after passing through the eyepiece the rays from the virtual image of the whole object would tend to enter the eye of the observer at the same visual angle as the rays from the top and the bottom of the real image of the chimney would cross one another in their transit through the eyepiece if it were a real object there situated; and so we may look at the matter as if that crossing-point in the eyepiece were itself the organ of vision. From that point the real image of the size mentioned at say $\frac{1}{2}$ inch distance would subtend an angle of 13° 30′, or an angle whose tangent is $\frac{24}{1000}$, or twenty-four times the preceding. But the apparent size is proportional to the tangent of the visual angle measured with reference to the axis of the system; hence the magnification here is as 24 to 1, or as 1 foot (the focal distance between the real image and the objective) is to $\frac{1}{2}$ inch (that between the real image and the eyepiece). If in this last case the aperture of the object-glass had been the same as that of the pupil of the eye, the magnification would have been the same, 24 : 1; but there would have been a lack of illumination, because an equal amount of light from the same source would have been made to produce on the retina an image about twenty-four times as large linearly, or 576 times superficially.

If, however, in the case supposed, the objective be twenty-four times as great in diameter as the pupil of the eye, this is—apart from loss of light by absorption in the lenses—compensated for, and the illumination is restored. With lenses of larger diameter than is necessary to compensate the loss of illumination by magnification, the field appears brightly lit. Where there is no loss of illumination through magnification, as in the case of stars, which are too far to be magnified into appreciable discs, the increase of brightness in the objects viewed enables objects to be seen which make no impression upon the naked eye. Suppose a star to be so far as to be visible and no more; then another equal star, ten times as far, would appear to shine, under the law of inverse squares (see LIGHT), with one-hundredth the intensity of the former, and would be invisible to the eye; but if its light were collected over an area a hundred times as great as that of the pupil, and sent into the eye, the eye would again be just enabled to perceive it; and in order to secure this hundred-fold area the diameter of the objective must be ten times that of the pupil of the eye. The space-

penetrating power of a telescope is therefore—assuming that there is no loss of light in the telescope itself, which is not the case—directly proportional to the diameter of the objective.

The Opera-glass (q.v.) is often described as a form of telescope under the name of Galileo's telescope; and, while it does not magnify greatly, it is very serviceable in collecting much light and brightening the field. Sir Francis Galton said (*Vacation Tours in South Africa*, chap. ix.) that a large opera-glass was 'one of the most perfect of night-glasses, besides being the most useful of telescopes.'

As to the unavoidable imperfections of the telescope, we find in the first place that even with a mirror, as in a reflecting telescope, where we are not annoyed by the breaking up of white light into its component colours, since the Law of Reflection (q.v.) is the same for all rays, it is impossible to form a perfectly sharp image of more than *one* definite point at a time. In order to do even this the mirror must be formed as part of the prolate spheroid produced by the rotation, about its longer axis, of an Ellipse (q.v.), one of whose foci is the object-point, the other the image. If the object-point be, like a star, practically at an infinite distance, the requisite form of the mirror is that formed by the rotation of a Parabola (q.v.) about its axis. The axis of the mirror must then be directed to the object-point, and all rays from it will, after reflection, pass accurately through the focus. But this is not strictly true for any other object-point in the field of view, although it is so nearly true that no inconvenience is practically found to result. But if the mirror used be part of a sphere, no point can be found such that rays diverging from it shall all be brought after reflection accurately to one point of the image; and this defect, called *Spherical Aberration*, increases with the surface of the mirror of any given radius; so that by increasing that surface, for the attainment of brightness, we increase proportionally the indistinctness of the image. To give an idea of the delicate manipulation required in the construction of a reflecting telescope we take the case of a speculum of 4 feet aperture and 40 feet focus, as calculated by Sir J. Herschel. If this be first ground to a truly spherical form it must have a radius of 80 feet. Now, such a mirror will give a very indistinct image, even under the most favourable circumstances; yet to grind it to the parabolic form, which is practically perfect, leaving the middle untouched, and grinding more and more away from its surface as we proceed outwards to the edges, even at the edges we have to remove a film of metal of only the $\frac{1}{211333}$d part of an inch, somewhere about the $\frac{1}{100}$th part of the thickness of the paper on which this is printed! The spherical aberration is partly compensated in Cassegrain's modification of Gregory's telescope, in which the small secondary mirror is convex.

Lenses, whether the object-lens or the eye-lens, have this defect also; but, as a rule, the most conspicuous fault of single lenses is their *Chromatic Aberration*, which arises from the different refrangibilities (see REFRACTION) of the various coloured rays, and leads to the formation, by a lens, of separate overlapping images of a bright object for each coloured ray. The remedy consists in *achromatising* (see ACHROMATISM, REFRACTION) the lens—i.e. forming it of two or more lenses of different kinds of glass, so that the colours, separated by one, shall be reunited by the others. The curvatures of the lenses which make up the achromatic combination, and the distances between them, may be so chosen as to minimise the effects of spherical as well as of chromatic aberration. Galileo's telescope has less chromatic and spherical aberration than the common astronomical telescope, and is shorter, since the distance between the lenses is approximately the *difference*, not the *sum*, of their focal lengths.

Before the discovery of the possibility of forming an achromatic lens Huygens, Cassini, and others had endeavoured, by enormously increasing the focal length of the object-glass of the common astronomical telescope in proportion to its diameter, to get rid as far as possible of chromatic aberration.

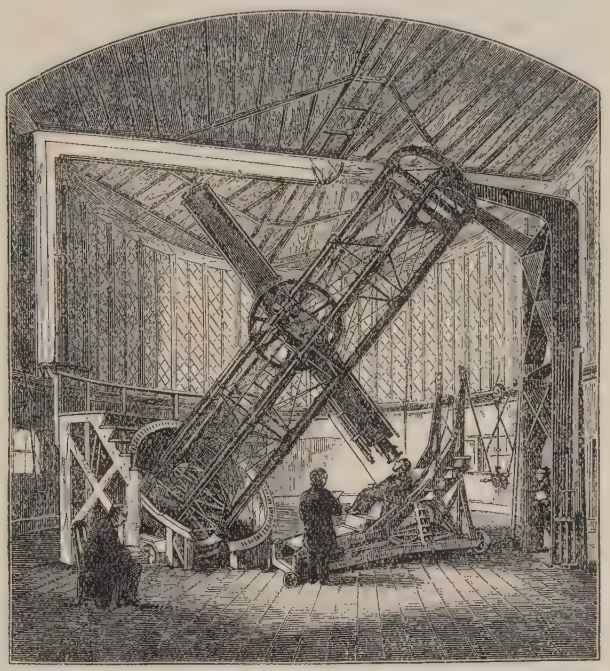


Fig. 4.—The Great Equatorial Telescope at Greenwich Observatory (from Dunkin's *The Midnight Sky*).

They thus formed the *aërial* telescope, in which the object and eye lenses were mounted separately on stands; the tube (which would have been 100, 200, or even 600 feet long) being dispensed with. Valuable work was done with some of these telescopes, of 125 feet focus, but the longer ones proved unmanageable. The principle involved in these constructions is, practically, the throwing the magnifying power more on the object-lens than on the eye-lens for the image formed by the former was still so imperfect as not to bear much additional magnification. The great step required for shortening the unwieldy instrument was therefore the perfecting of the object-lens, by achromatisation. Various very ingenious improvements on achromatic combinations, which might even yet be thought worthy the consideration of opticians, were devised by Dr Blair. He found solutions of mercury or antimony in hydrochloric acid to be much more refractive and more dispersive than crown-glass, while no irrationality of dispersion as compared with crown-glass could be detected in them. By means of lenses filled with these liquids he was enabled to

give the telescope an aperture of one-third of its focal length without a trace of residual colour.

The process of Liebig for depositing on glass an exceedingly thin film of silver, which, by careful polishing, can be rendered more highly reflective than any other material, has been taken advantage of by Steinheil in the construction of large specula for reflecting telescopes. This is an immense step, since any disk of glass will do, its optical properties not being employed; while, if it be once brought to a true parabolic figure, the silvering may be renewed as often as may be required. One of the great difficulties in the construction and working of large reflectors has hitherto been the casting and annealing of metallic masses of some tons' weight. This, in the silvered specula, is entirely avoided. Glass, however, gives trouble on account of its being slightly deformed by changes in temperature; and considerable attention has recently been paid to its replacement by fused quartz, which, once obtained, is easier to work and is unaffected by temperature changes. We cannot here enter into a description of the processes, often extremely ingenious, which have been devised for the grinding, figuring, and polishing of lenses and specula. Neither can we enter into the great differences which exist in the modes of mounting astronomical telescopes with a view to their ready adjustability by the observer. See EQUATORIAL, OBSERVATORY. The telescope has also been modified so as to act as a photographic camera with wide-angle, wide-aperture lenses, capable of photographing a fairly extensive region of the heavens.

Amongst the largest reflecting telescopes were those of Lord Rosse at Birr (72-inch mirror, 1844), Mr Commons, London (1889, 60 inches), Bessemer (50½ inches), Sir William Herschel (48 inches, 1789, long since dismantled), Melbourne (48 inches), Paris Observatory (47 inches); and more recently the 60-inch and the 100-inch at Mount Wilson Observatory, California, and the 72-inch at Victoria, British Columbia. To the largest refracting telescopes belonged those of Yerkes Observatory, Chicago (41½ inches, 1897), Lick Observatory, California (36 inches, 1880), Pulkowa (30 inches, 1885), Vienna (27 inches), Nice (30 inches), Greenwich (28 inches; see fig. 4); and more recently the Thaw refractor at the Allegheny Observatory (30 inches), Simeis, Crimea (40 inches), Nikolaiev, South Russia (41 inches), Bloemfontein (27 inches). Among photographic telescopes may be mentioned the 16-inch aperture instrument at Arequipa (Harvard University's station), and the 10-inch at Mount Wilson, California.

For the subject in general, see Sir John Herschel's *Telescope;* and for the history, the histories of astronomy and the monograph by Servus, *Geschichte des Fernrohrs* (1883).

Television, a hybrid word, for which Teleoptics has been proposed without avail as a substitute, signifies the art of doing for the eye what telephony does for the ear. The sensitiveness of Selenium (q.v.) to light suggested early experiments. More sensitive photo-electric cells have since been devised. Mr J. L. Baird uses a large wheel set with lenses so arranged as to sweep rapidly over the whole field of view, directing the light from each part successively upon a cell, so that an electric current is strong when bright light falls upon the cell, weak when shadow. The current controls a beam of light at the receiving end as it sweeps over a ground-glass screen in synchronism with the transmitting apparatus.

Telfairia, a tropical African genus of Cucurbitaceæ. The seeds of *T. pedata* are edible and yield oil.

Telford, THOMAS, engineer, was born in Westerkirk parish, Eskdale, Dumfriesshire, on 9th August 1757, the son of a shepherd. During the intervals of his attendance at school young Telford or Telfer (so he was registered) followed the same calling, diligently employing his leisure moments in the perusal of whatever books were within his reach. At fourteen he learned the trade of a stone-mason at Langholm. In 1780 he removed to Edinburgh, and in 1782 to London, obtaining employment under Sir William Chambers on the erection of Somerset House. In 1784 he was appointed to superintend the erection of the resident commissioner's house at Portsmouth dockyard, a work which afforded Telford the opportunity of mastering the details of construction of docks, wharf-walls, &c. In 1787 he was appointed surveyor of public works for Shropshire; and his two bridges over the Severn at Montford and Buildwas gained for him the planning and superintendence of the Ellesmere Canal, to connect the navigation of the Severn, Dee, and Mersey (1793–1805). In 1790 he was appointed by the British Fishery Society to inspect their harbours; and in 1801 he received a commission from government to report on the public works required for Scotland. As a consequence the construction of the Caledonian Canal (q.v.) was entrusted to Telford, who also executed more than 1000 miles of road in the Highlands, Lanarkshire, and Dumfriesshire, and about 1200 bridges, besides churches, manses, harbours, &c. His next great work was the road from London to Holyhead, including the erection of the Menai Suspension Bridge, and the last was St Katharine's Docks (1826–28) in London. Among other works by him are, of bridges, the Conway, the Broomielaw in Glasgow (1833–36), and the Dean in Edinburgh (1831); of canals, the Macclesfield, the Birmingham and Liverpool Junction, the Gloucester and Berkeley, the Weaver system, the great tunnel (1¾ miles long) on the Trent and Mersey; of harbours, Wick, Dundee, Peterhead, Banff, Fraserburgh, Fortrose, Cullen, Kirkwall, and Aberdeen. He was the first president of the Institute of Engineers; he supplied the nucleus of a library, and left towards it its first bequest of £2000. By Southey he was termed 'the Colossus of Roads' and 'Pontifex Maximus.' He died at Westminster, 2d September 1834.

See *Life* by himself (1838), which contains some specimens of Telford's homely poetry in its appendix, with its accompanying folio atlas of plans; and Smiles's *Lives of the Engineers* (vol. ii. 1861).

Tell, a district in the extreme north-west of Africa, stretches along the shores of the Mediterranean, and comprehends the corn-growing tracts extending south from the Mediterranean to the Atlas Mountains, and from west to east through Morocco, Algeria, and Tunis. The Tell is noticed under the articles MOROCCO and SAHARA.

Tell, WILLIAM, was, according to Swiss tradition, a countryman of Bürglen in Uri, who early in the 14th century rescued his native district from the tyranny of Austria. The following is the generally accepted version of the story. Albert I., Duke of Austria and German emperor, was in 1307 striving to annex the Forest Cantons to his immediate possessions. Hermann Gessler, his *vogt* or steward, perpetrated atrocious cruelties on the inhabitants. Werner Stauffacher of Schwyz, Walter Fürst of Uri, father-in-law of Tell, and Arnold Melchthal of Unterwalden met on the Rütli Meadow, 7th November 1307, and solemnly swore they would expel their oppressors before the following New Year's Day. Gessler had placed the ducal hat of Austria on a pole in the marketplace of Altorf and intimated that any one who

passed it without uncovering would be punished without mercy. Tell and his boy failed to do reverence to the hat, and were sentenced to be put to death unless Tell, who was a famous bowman, could hit an apple placed on his son's head. Tell performed the feat. 'What,' asked Gessler, 'would you have done with the second arrow in your bow?' 'Shot you if I had killed my child,' was the reply. Tell was bound and thrown into a boat to be taken with Gessler and his men to the Castle of Küssnacht, the residence of the tyrant. A frightful storm burst forth. Tell alone could save the party. He was unbound and pulled the boat to a rocky ledge, 'Tell's Platte;' he there sprang on shore and disappeared. The tyrant landed and was passing through a defile, the 'Hohle Gasse' near Küssnacht, when Tell, who lay in ambush, shot him through the heart. A rising followed, and wars with Austria, which ended in the independence of Switzerland.

The story was told as true by Johannes von Müller in his great history of Switzerland. Schiller made it the subject of his greatest drama and Rossini of his best opera—and 'the patriot Tell' became the best-known hero the world had seen. Doubts, however, had been expressed as early as the beginning of the 17th century as to the very existence of Tell. In 1754 Voltaire cast a characteristic sneer at 'the apple story,' and in 1760 Freudenberger, a Bernese Protestant clergyman, published a pamphlet, *Tell, a Danish Fable*, pointing out that the story of the apple is the Scandinavian fable of Toko. His work was condemned by the government of Uri and burned by the common hangman. The doubts were not extinguished. The comparative mythologists showed that the Tell story was merely a Scandinavian form of an old Indo-Germanic myth (see Ideler, *Die Sage vom Schusse des Tell*, 1826). Egill, Wayland Smith's brother, performed the apple feat. An excellent parallel is that in our own north-country ballad, 'Adam Bell, Clym of the Clough, and William of Cloudesley,' printed in Percy's *Reliques*. The 'master-shot' indeed is not the property alone of Aryan folklore, but is found among Samoyeds, Turks, and Mongolians alike. It was further found that Tell is first mentioned in 1470 in a ballad, between 1482 and 1488 in the *Chronicle* of M. Russ of Lucerne, and in 1511 in a play acted in Uri. The first makes Tell the hero of the apple story and the rising which followed. Russ and the Uri play take no notice of the apple story, but refer to the boat scene and the atrocities of the bailiffs. They make Tell the hero of the revolution. A MS. known as the *White Book of Sarnen* (*c.* 1470) first combined the apple story and the atrocities. It makes the Rütli oath the pivot of events, and Stauffacher, not Tell, the hero. Tschudi in his *Swiss Chronicle* (1572) first melted all these incidents into a consistent narrative. He fixed the date of the Tell rising at New Year's Day, 1308, and Von Müller, warned by the fate of Freudenberger, with palpable misgivings told the tale as true history (see Vischer, *Die Sage von der Befreiung der Waldstädte*, 1867). There is no trace of Tell to be found in contemporary records. His name did not appear where it should have done in lists connected with the *landesgemeinden* of the period; in the register of deaths at Schaddorf it had been forged. The chapel on Tell's Platte was first mentioned in 1504, and the document declaring it to have been built by a *landesgemeinde* held in 1388 at which 114 men were present who had known Tell only appeared in 1759. The Tell chapels at Bürglen and the Hohle Gasse, represented as existing since the 14th century, belong to the 16th. Professor J. E. Kopp of Lucerne showed that the date of the Tell rising is inconsistent with the history of the Forest Cantons (see Kopp, *Urkunden zur Geschichte der Eidgenössischen Bünde*, 1851). A complete record has been published of all the occupants of Küssnacht from 1250 to 1513. Among them there is no Gessler (see Rochholtz, *Tell und Gessler in Sage und Geschichte*, 1876). The researches of many other writers have gone to prove that there is no truth in any incident of the Tell legend. Although inconsistent with history, they, however, are not yet generally recognised as mythical. The people of the Forest Cantons cling even to the apple story. In 1890 a ferment was raised in Uri by the publication of a school history of Switzerland which did not mention Tell and the Rütli oath. Excellent French works on general history still represent all the incidents as historical, expressing a mere doubt as to the apple story; this is justified in a long article in the *Nouvelle Revue* of July 1891. It attributes disbelief in Tell to a conspiracy of German savants actuated by sycophancy, jealousy, and antipathy to liberal ideas. More recently some Swiss writers have attempted to recast the story with a modified historical basis, but with no outstanding success. See Albert Rilliet, *Les Origines de la Confédération Suisse, Histoire et Légende* (1868).

Tell el-Amarna, the modern name of a mass of ruins representing the capital of the heretic Egyptian king, Amenhotep IV. (see EGYPT, Vol. IV. p. 241), a little to the north of Assiut, on the eastern bank of the Nile. Here was found in 1887 a collection of tablets in Babylonian cuneiform, at that period—some time before the Exodus of the Israelites out of Egypt—used as a kind of *lingua franca* for all western Asia. These tablets were mainly reports from the Egyptian governors of Palestine, Syria, Mesopotamia, and Babylonia, some of which implored help against the Hittites (q.v.), then pressing southwards. Of about 230 tablets 160 went to the Berlin Museum and 82 to the British Museum. The site has been excavated by many explorers. Petrie discovered the palace-temple in 1891, and in 1914 the German expedition found the remains of a sculptor's studio, containing some of the finest examples of the art of that period.

Tell el-Kebir, midway on the railway between Ismailia and Cairo, was the scene on the morning of 13th September 1882 of Wolseley's capture of Arabi Pasha's entrenched camp, defended by 26,000 men. The British loss was about 430 killed and wounded, the Egyptian 1500.

Tell el-Obeid. See UR.

Téllez, GABRIEL, better known by his pen-name of 'Tirso de Molina,' a Spanish dramatist of great reputation, was born in Madrid in 1585, entered the order of the Brothers of Charity at Toledo, and died prior of the monastery of Soria in 1648. Téllez was a friend and pupil of Lope de Vega, whom he almost rivalled in facility of execution. His pieces are partly *Comedias*, partly Interludes, and *Autos Sacramentales* (originally about 300, of which but few survive), all displaying dramatic vitality, originality, and power of character-painting. The wit is rich and natural, and the language highly poetical. Some of his comedies still keep the stage. Among the best are *El Burlador de Sevilla* (*Don Juan*), *El Vergonzoso en Palacio*, *Don Gil de las Calzas Verdes*, and *Marta la Piadosa*. The best edition of his works is that of Hartzenbusch (12 vols. Madrid, 1839-42); there is a selection in the *Biblioteca de Autores Españoles* (vol. v. 1850). See a monograph by Muñoz Peña (Madrid, 1889).

Tellicherri, a seaport town and military station of British India, in the district of Malabar, Madras Presidency. The site of the town is very beautiful, and the neighbouring country highly

productive. There is a natural breakwater abreast of the fort, formed by a reef of rocks running parallel to the shore. The town, with suburbs, occupies about 5 sq. m. Coffee, cardamoms, and sandalwood are the chief exports. The East India Company founded a factory here in 1683, which was reduced to a residency in 1766. The old citadel and residency survive. Pop. (1921) 27,576.

Tello. See BABYLONIA, ART.

Tellurium (sym. Te; at. number 52; at. wt. 127·5) is a chemical element, which some authorities place among the metals, and others among the non-metallic bodies or metalloids. Although in its outward characters it closely resembles the metals, its close analogies with sulphur and selenium indicate that its true place is amongst the metalloids. It possesses a high metallic lustre, and is bluish white in colour; it melts at about 500° C., and at a higher temperature is converted into a yellow vapour; it is a bad conductor of heat and electricity, and is very brittle. Its specific gravity is 6·24. When strongly heated in the air it burns with a blue flame and gives off white fumes of tellurium dioxide. Like sulphur and selenium, it is soluble in cold oil of vitriol, to which it gives a fine purple-red colour, and on dilution it is precipitated unchanged: in these respects it differs from all metals. In nitric acid it dissolves with oxidation.

Tellurium forms two compounds with oxygen —viz. the dioxide TeO_2 and the trioxide TeO_3, corresponding to the oxides of sulphur, and two acids, tellurous H_2TeO_3 and telluric H_2TeO_4. *Tellurous acid* exhibits very slight acid properties, and its anhydride combines with acids, and acts the part of a weak base. These salts have a metallic taste, and are said to act powerfully as emetics. Tellurium trioxide has also a feeble affinity for bases, but it forms salts, which contain 1, 2, and 4 molecules of the trioxide to each molecule of base. Tellurium unites with hydrogen to form telluretted hydrogen, H_2Te, which is a gaseous body, analogous to sulphuretted hydrogen, and precipitates most of the metals from their solutions in the form of tellurides, which have a close analogy with the corresponding sulphides.

In experimenting upon the action of the salts of tellurium, it has been found that they possess the power of forming, in the body of a healthy person, compounds which impart to the breath, to the perspiration, and to the gases generated in the intestinal canal a disgusting fetor, which makes him a nuisance to every one he approaches; and this smell may last for weeks, although the quantity of tellurium that was administered did not exceed a quarter of a grain.

Tellurium is a rare substance, found chiefly in Transylvania, but also in Hungary, in North America, and in the Altaï silver mines. It sometimes occurs native, but more commonly as a telluride of gold, lead, or silver.

Telugu. See INDIA, p. 102.

Tembu. See KAFFIRS.

Temişoara, or TEMESVÁR, a city of Rumania (till 1920 of Hungary), consisting of the city or 'citadel,' with four suburbs, on the Bega Canal, 160 miles SE. of Budapest by rail. It has a fine cathedral, an ancient castle, a magnificent episcopal residence, manufactures of flour, tobacco, cloth, silk, paper, leather, wool, and oil, and a brisk transit trade in grain, wax, honey, brandy, and horses. Temişoara has endured a great number of sieges—the latest being that of 1849, when it was besieged and bombarded for 107 days by the Hungarian insurgents, but was relieved by Haynau. Pop. 90,000.

Tempe, a famous mountain-gorge, some six miles long and 100 to 2000 paces broad, in the north-east of Thessaly, between the mountains of Olympus and Ossa. The river Peneus forces its way through the rocky ravine to the sea, and along its right bank runs the tract, at some points hewn out of the rock. The vegetation is so rich and the scenery so grand that the name of Tempe became in ancient times a synonym for any beautiful valley, as the Tempe near Reate through which flowed the Velinus, and the Tempe in Sicily formed by the Helorus. Tempe was a favourite haunt of Apollo.

Tempera. See DISTEMPER.

Temperament is a term which has been employed in Physiology to designate certain physical and mental characteristics presented by different persons. A fourfold classification was long universal, doubtless based on the old idea of four humours (see HIPPOCRATES). But the two generally regarded as fundamental are the *sanguine* and the *melancholic*, the *phlegmatic* being a degree or modification of the sanguineous, and the *choleric* of the melancholic.

Some writers recognise a *nervous* temperament, in which the predominating characteristic is a great excitability of the nervous system, and an undue predominance of the emotional impulses—a temperament always associated with the sanguineous or the melancholic. The names of the jovial, mercurial, and saturnine temperaments are reflections of Astrology (q.v.). The artistic temperament is also a very current phrase. In both sexes the characteristics of the temperaments are far less manifest in old age than in earlier life. The different temperaments often merge so gradually into one another that very often it would be extremely difficult to decide to which variety any special case belongs.

Temperament is a system of compromise in the tuning of keyed instruments. Though the various intervals of the scale are spoken of broadly as consisting of tones and semitones, the successive tones are not all equal when given in just intonation according to harmonic law—i.e. so that the consonant intervals are in perfect tune; and as every note in the scale may become the keynote of another scale, if all these scales are to be given exactly a complete set of keys for each would be necessary. But it has been found in practice that by only a slight deviation from just intonation a much more limited keyboard, of twelve notes to the octave, gives results which do not offend the ordinary ear, though the discrepancy is distinguishable by a trained one. Up till about the beginning of the 19th century in Germany, till 1835 in France, and 1846 in Britain, the system generally adopted was that known as *mean* temperament, by which the intervals in some keys (those not employing more than three sharps or flats in the signature, and a few of the minor keys) were more exactly in tune than in others; some of the intervals in the less favoured keys, known as *wolf* intervals, being so unpleasantly out of tune as to cause composers to avoid these keys. This was remedied in a few instances by the use of two divided keys, one of which gave separately D♯ and E♭, and the other F♯ and G♭. The present practice, known as *equal* temperament, was foreshadowed by John Bull in his fantasia (from the *Fitzwilliam Virginal Book*) in which he states his theme in each of the twelve major keys, and by J. S. Bach in *Das Wohltemperirte Klavier*. Each tone and semitone in the octave is made approximately equal, so that every key is equally available; while at the same time every interval except the octave deviates slightly from just intonation. This deviation is more obvious on the organ, or still more the harmonium, than on the pianoforte; but it is of more

practical moment in the orchestra, where keyed instruments are heard along with others playing in just intonation. There are many advocates of a system of just intonation, at all events as applied to special instruments; and various keyboards have been invented to obviate the mechanical difficulties. The subject is still a favourite battlefield of theorists. Ensembles, such as that of the unaccompanied choir or of the string quartette, are, of course, free from the difficulty of temperament. See Helmholtz on *Sensations of Tone* and Bosanquet on *Musical Intervals and Temperament;* also the article SOUND.

Temperance. This term is defined in Murray's *New English Dictionary* as (*inter alia*) 'rational self-restraint,' and specifically as 'moderation in regard to intoxicants; sobriety; the practice or principle of total abstinence; teetotalism,' which last-mentioned use of the term follows Hobbes's definition of temperance as 'the habit by which we abstain from all things which tend to our destruction' (*De Corpore Politico*, cap. iv. s. 14).

Ages before scientific research had isolated alcohol and ascertained with precision its action on the human organism, the universal experience of mankind had realised the risks attending the consumption of what are now known as alcoholic liquors, and the social evils arising therefrom; and the moral codes of the great religions of the world have all either enjoined abstinence from such liquors, or inculcated that strict sobriety which abstinence alone can effectively secure. As a result a very large proportion of the human race avoids the use of these liquors.

Their manufacture and consumption have, however, prevailed to such an extent as often to call for special methods of cure and prevention; and the increasing industrialisation and urbanisation of civilised countries during the past two centuries, with the tendency to bad conditions of living and increased temptation to intemperance, have made the temperance problem one of present-day urgency.

During the 18th century the ravages of what Lecky called the 'gin epidemic' led to measures of a persuasive and legislative character designed to check this social danger. The earliest attack was made upon the use of spirits. In England Dr George Cheyne (1671–1743) denounced the use of spirits, and later Dr Beddoes of Bristol, Dr Thomas Trotter (of the Royal Navy), and Dr Erasmus Darwin took the same side, while Dr Samuel Johnson and John Howard the philanthropist set an example as abstainers from all alcoholic liquors. John Wesley forbade the use of spirits to his followers, and denounced the makers and vendors of such liquors as 'poisoners-general to His Majesty.'

In the United States Dr Benjamin Rush of Philadelphia adopted the same attitude to spirits; but while there were sporadic attempts to unite public sentiment against spirit-drinking, it was not until 1820 that the formation of the American Temperance Society at Boston inaugurated what is now known as 'the Temperance Movement.' This society did a remarkable work, especially in New York State. Its publications, the *Journal of Humanity*, the *Temperance Recorder*, and the *American Temperance Intelligencer*, had a very wide circulation, and large numbers of persons were reclaimed from intemperance.

In 1829, in Ireland, Professor Edgar of Belfast and the Rev. G. W. Carr of Wexford aroused a large amount of temperance sentiment in that country; and John Dunlop of Greenock and others promoted similar efforts in Scotland.

The first temperance society in England was formed at Bradford, Yorkshire, in 1830, by Henry Forbes; and other societies were speedily inaugurated, the London organisation being converted in 1831 into 'The British and Foreign Temperance Society.' In 1834 public interest was aroused by the proceedings of a Select Committee of the House of Commons, promoted by J. S. Buckingham, M.P., to inquire into the causes, extent, and remedies of drunkenness. The Beer Act of 1830 had just led to the opening of many thousands of beer-houses, and greatly aggravated the existing evils, and bitterly disappointed the hopes of its promoters, who thought it would diminish spirit-drinking and substitute 'good malt and hops which could injure nobody.'

By 1835 temperance societies on the anti-spirit basis had been formed in all British colonies and in some continental countries such as Germany, Sweden, and, later, Russia, Prussia, and Denmark. It soon, however, became clear that to be effective the movement must promote total abstinence not merely from spirits, but from beer, wine, and other alcoholic beverages, and in September 1832 seven members of the Preston Temperance Society in England allowed Joseph Livesey to attach their names to a pledge of total abstinence from all intoxicating liquors; but it was not until 1835 that the full total abstinence pledge was made the test of membership. In 1833, at one of the meetings, Richard Turner, usually called 'Dicky Turner,' a rough, humorous speaker, advocating total abstinence as against 'moderation,' exclaimed, 'I'll be reet down out-and-out tee-tee-total for ever and ever.' The audience cheered, and Livesey added, 'This shall be the name of our new pledge.' The years 1835 to 1845 were years of great activity in the temperance cause throughout the world. In the United States a system of total abstinence was universally adopted in place of the limited anti-spirit principle. Considerable activity was shown in Scotland, and in Ireland remarkable developments followed the signing by Father Mathew in 1838 of the total abstinence pledge in Cork. From 1839 to 1842 this earnest priest visited nearly every part of Ireland, including the north, and administered the pledge to millions of people. There was an enormous consequent reduction in spirit consumption, and a lessening of drunkenness and crime.

In 1846 the first World's Temperance Convention was held in London, attended by 305 delegates.

Although the temperance leaders in all places were almost invariably religious men, the great majority of Christian churches did not, in their corporate capacity, at first unite in temperance work, but now every Christian denomination has its temperance society or department; and under the Temperance Council of the Christian Churches, formed in England in 1915, and consisting of the Baptist Total Abstinence Association, Baptist Union of Wales and Monmouthshire Temperance Association, Catholic Total Abstinence League of the Cross, Church of England Temperance Society, Congregational Union Temperance Committee, Congregational Union of Wales, the Society of Friends, the Moravian Church, Presbyterian Church of England, Presbyterian Church of Wales, Primitive Methodist Temperance Committee, the Salvation Army, United Methodist Temperance Committee, and the Wesleyan Methodist Temperance Committee, the churches take united action within the scope of the Council's activities. The Church of England Temperance Society, founded in 1873, has, however, a dual basis, membership not being confined to abstainers. The great majority of the ministers in the Nonconformist churches in the United Kingdom are total abstainers, and nearly the whole of the students; and a steadily increasing number of clergy in the Established and Roman Churches are taking the same stand.

The phrase 'Band of Hope' was first applied to juvenile societies in 1847, and this movement has greatly developed. It is estimated that at least 3,750,000 young persons are embraced in Bands of Hope and other juvenile societies in the United Kingdom, and the United Kingdom Band of Hope Union is one of the leading national organisations.

The evils arising from friendly societies and benefit clubs meeting in public-houses led to the formation in 1835 of the Independent Order of Rechabites, and later, in 1855, to the founding of the Order of the Sons of Temperance. The progress of these orders is shown as follows:

	Adult Members.		Juvenile Members.		Funds.	
	Rechabites.	Sons of Temp.	Rechabites.	Sons of Temp.	Rechabites.	Sons of Temp.
					£	£
1870..	15,402	7,707	4,389	1,301	90,824	10,101
1880..	34,641	15,253	16,684	1,721	243,214	46,440
1890 .	95,074	26,663	47,495	7,559	531,973	102,087
1900..	168,293	49,287	100,896	21,886	1,130,638	221,205
1910..	259,508	97,262	210,775	73,836	2,250,086	480,891
1920..	377,524	159,618	462,523	144,825	3,721,480	795,466
1924..	379,533	160,883	439,749	121,710	4,402,143	1,037,750

Both societies are approved under the National Insurance Acts, and have together 556,000 state-members; and, eliminating duplicates, 750,000 adult total abstainers (state and voluntary) are to-day members of these two orders.

In 1868 Joseph Malins, who died at the age of 82 in January 1926, introduced into England from the United States the Order of Good Templars, which, as an international order, numbers over half a million members.

In 1876 the British Women's Temperance Association was formed, and in 1893 the Women's Total Abstinence Union; these societies are now united under the style of the National British Women's Total Abstinence Union.

As the movement for total abstinence progressed, temperance reformers increasingly realised that for many persons abstention from intoxicating liquors, in the presence of the facilities on every hand for the common sale of liquor, was practically impossible, and that the only effective solution of the drink problem was the elimination of alcoholic beverages from the social life of the community. Inasmuch as this could only be secured by legislative action, the United Kingdom Alliance was founded in 1853 for the legislative suppression of the liquor traffic. Its first president was Sir W. C. Trevelyan. He was succeeded in 1879 by Sir Wilfrid Lawson, who held the presidency till his death in 1906.

Its agencies of all kinds, while engaged in the dissemination of information as to the social, economic, and political aspects of the liquor problem, have for their special object the election of members of parliament favourable to the legislative suppression of drink by the votes of the people. As a first step, the Alliance has, since 1864, advocated a measure of legislation (Local Option) which would enable every district to decide by direct vote of the local electors whether the liquor traffic should exist therein or not. Such proposals have been repeatedly brought before parliament, and in 1908 received the sanction of a large majority of the House of Commons, though rejected by the House of Lords. In 1913 the Temperance (Scotland) Act was passed, securing to Scotland, in a somewhat imperfect form, this power, and Local Option is now the agreed policy of the whole organised temperance forces in the United Kingdom. The influence of the Alliance has extended far beyond this country, and to-day, in Canada, Australia, New Zealand, and South Africa, temperance 'Alliances' are operating vigorously on the lines originally laid down by this organisation. The Alliance, through its political and literary secretary, publishes annually *The National Drink Bill*, accepted by all parties as a reliable estimate of the national expenditure on, and consumption of, drink; the *Alliance Year-book*, now the annual of the movement; and its monthly organ, the *Alliance News*, is the leading temperance journal in the country.

In Scotland the cause has probably a stronger hold numerically and politically than in any other section of the United Kingdom. In 1920, out of 1,697,251 local government electors entitled to vote, 1,181,405 (or 69·6 per cent.) took part in the first Local Option polls; and of these, 453,278 (or 38·4 per cent.) voted for no licence. In 1924 there was a union of the temperance forces, which now operate as the Scottish Temperance Alliance. In Ireland the Society for the Prevention of Intemperance represents temperance opinion and effort in the Irish Free State; while the Irish Temperance Alliance combines the forces in Northern Ireland.

Outside the United Kingdom the progress of the movement has been very marked during the present century, and the experience of the benefits of restrictions imposed during the Great War on the traffic has directed the attention of most civilised nations to the desirability of a greatly lessened consumption of alcohol. Effective temperance societies are at work in most countries. In Canada, the Dominion Alliance and the Women's Christian Temperance Union; Australia, the Australian Alliance Prohibition Council; New Zealand, the New Zealand Alliance; South Africa, the South African Temperance Alliance and Women's Christian Temperance Union; Norway, Federation of Norwegian Total Abstinence Organisations; Sweden, a similar organisation; France, Ligue Nationale Contre L'Alcoolisme; Denmark, Federated Danish Total Abstinence Organisations; and other organisations in other countries. The World League Against Alcoholism federates the leading organisations in thirty countries for certain special purposes. There is also a valuable International Bureau Against Alcoholism at Lausanne, under Dr Robert Hercod, which collects and files much information on this question.

The non-recognition by the then existing life insurance companies of the fact that the average longevity of abstainers is greater than that of consumers of alcoholic liquors, led in 1840 to the foundation of the United Kingdom Temperance and General Provident Institution, having a separate temperance section, and other societies have since been formed on similar lines. The experience of the United Kingdom Temperance Institution has been as follows:

Percentage of Actual to Expected Claims.

Period.	Temperance.	General.	Difference.
1866-70	74·9	93·7	18·8
1871-75	70·7	105·1	34·4
1876-80	69·8	99·7	29·9
1881-85	70·8	91·6	20·8
1886-90	68·9	94·8	25·9
1891-95	71·3	99·7	28·4
1896-1900	73·8	90·5	16·7
1901-05	72·0	88·3	16·3
1906-10	65·7	83·3	17·6
1911-15	62·8	83·9	21·1
*1916-20	77·4	82·6	5·2
1921-23	53·5	72·2	18·7
1924	54·1	64·2	10·1
1925	52·6	74·6	22·0
1926	46·6	64·3	17·7
1924-26	51·1	67·7	16·6

* Excluding Great War claims, 62·1, 71·8, 9·7.

The Scottish Temperance Insurance Company shows a percentage during 1883-1922 of 54 in the temperance and 69 in the general section. The Abstainers and General Insurance Company for the period 1884–1924 shows 44 in abstainers and 52·1 in the general section.

The Factors in the Problem.—The factors which, during the past half-century, have probably affected this problem are of three kinds:

A. Increase or decrease of opportunity, due to increased or diminished spending power; variations in the price of intoxicants caused by taxation or otherwise; and restrictions on the number of drink-shops, and on the hours of sale. Probably the governing factor here is the spending power.

B. Social changes, such as the movement from the city to the suburbs; the garden city; greater love for open spaces; facilities for travel, cheap excursions, cycling, motoring; sport; entertainments, including cinemas with the growth of the practice of two houses nightly; and last, but by no means least, the enormous increase in the number of temperance cafés.

C. Educational and moral causes, including the educational effect of 'the zealous labours of countless workers in the temperance cause,' which, as the majority report of Lord Peel's commission on licensing laws pointed out in 1899, 'counts for much;' the reports of official inquiries, such as that on Licensing Laws referred to, on Physical Deterioration in 1904, on the Poor-Law in 1909; and, not least, the change in and influence of medical opinion.

This change was at first very gradual, but during the present century it has been marked, largely due to the pioneer work of Dr W. B. Carpenter, Dr B. W. Richardson, and others. The publication and wide circulation of *Alcohol and the Human Body*, by Sir Victor Horsley and Dr Mary Sturge in 1907, is a landmark in medical temperance history; in 1909 the Board of Education issued a Syllabus of Hygiene and Temperance for use in elementary schools, containing the general ascertained physiological facts as to the action of alcohol and the social consequences of its excessive consumption. In 1917 the Central Control Board (Liquor Traffic) published a report of a committee of leading medical and physiological experts, entitled *Alcohol and the Human Organism*, which, as revised in 1923 by the official Medical Research Council, contains the latest unchallenged scientific findings on the subject: (*a*) that the main action of alcohol (apart from the effects of its continued excessive use) is confined to the nervous system; (*b*) that alcohol is narcotic rather than stimulant in action; (*c*) that its nutritional value is strictly limited; (*d*) that its habitual use as an aid to work is physiologically unsound; (*e*) that alcoholic beverages are in no way necessary for healthy life; that they are harmful or dangerous unless taken at infrequent intervals, in a diluted form, and in strictly moderate quantities; and (*f*) that they are definitely injurious for children and for most persons of unstable nervous system, notably for those who have had severe injuries to the head, or who have suffered from attacks of mental disorder, or from nervous shock. In view of these findings, in English business life there is an increasing realisation that a very large part of our human machinery is not running freely and unfettered. Delicate, complicated, and costly machinery, often effecting many processes in a single operation, has displaced the cruder methods of earlier days. Business and industry demand skilled men with clear brains; and there is no place for brains made dull and fingers made clumsy by drink. The increase of motoring has also awakened the general public to the danger of even a so-called moderate consumption of alcohol; and Benedict, the great American physiologist, has said: 'Inflexible science says to the motorist, "Moderate user, keep off! For at least four hours after a dose of alcohol formerly considered permissible you as a motor vehicle operator may well be considered a menace to society."'

In 1873 the increasing conviction that alcohol was not a necessary drug in the treatment of disease and accident led to the foundation of the temperance hospital, in which, while the visiting staff are authorised to give alcohol where they deem it necessary, the ordinary rule is treatment without alcohol. More than 48,000 in-patients have been treated, the mortality rate being only 7·8 per cent., and alcohol has not been administered in more than a fraction of the cases, namely ·39 per cent. The change in the attitude of the medical profession to the medicinal value of alcohol is indicated in the remarkable decline in its use in hospitals generally, as appears from the following table:

	1900.	1923.
Patients (276 hospitals)	383,182	670,841
Milk	£142,805	£376,202
Malt*	£9,106	£5,744
Wines and spirits*	£15,993	£23,103
Estimated ozs. in terms of brandy	2,645,204	916,380
Per patient (ozs.)	6·8	1·3
" " cost	10d.	8·2d.
Per occupied bed	13s. 1d.	9s.

* In 1923 malt liquors had more than doubled in cost, and spirits were nearly five times their cost in 1900.

Statistics of Consumption.—The following table gives the *per capita* consumption of beer and spirits (in quinquennial periods up to 1910) from 1871 to 1922 for the United Kingdom:

	Beer. Standard Gallons.	Spirits. Proof Gallons.
1871-75	32·3	1·18
1876-80	30·6	1·16
1881-85	27·6	1·02
1886-90	28·1	·96
1891-95	29·7	1·00
1896-1900	31·6	1·05
1901-05	29·5	1·00
1906-10	27·0	·80
1911-14	27·1	·68
1915-19	16·6	·51
1920	20·6	·47
1921	18·5	·39
1922	15·8	·36
*1923	17·0	·33
*1924	17·9	·33
*1925	17·9	·32
*1926	17·2	·29

* Great Britain only.

The following table associates these figures in terms of alcohol with certain social facts:

	Alcohol Gallons (U.K.).	Alcoholism and Cirrhosis per million (England and Wales).	Infant Mortality (England and Wales).	Drunkenness Proceedings per million (England and Wales).
1871-75	2·44	..	153	7399
1876-80	2·34	..	145	6602
1881-85	2·10	168	139	7049
1886-90	2·09	177	145	6101
1891-95	2·20	195	151	5901
1896-1900	2·33	221	156	6355
1901-05	2·19	200	138	6590
1906-10	1·94	158	117	5598
1911-14	1·87	144	110	4985
1915-19	1·20	87	97	1964
1920	1·40	63	80	2561
1921	1·24	64	83	2079
1922	1·07	62	77	2001
1923	*1·18	56	69	2007
1924	*1·24	55	75	2041
1925	*1·23	57	75	1930

* Great Britain only.

The decline is obviously much greater since the Great War began; but the important post-war factors of high taxation and much unemployment must be taken into account, and the warning of the late Lord Milner (1924) must be noted that: 'It would be totally contrary to all the experience of

the past if the next return of a boom period in the trade cycle was not accompanied by a fresh and great rise in the consumption of alcoholic liquor, unless, indeed, steps were taken to counteract what I can only call the secular tendency of times of prosperity and high wages, to result in an increase of drinking, and of the evils which result from excessive drinking.' In conclusion, it should be pointed out that the problem is one which most seriously affects the native races of the world, and considerable attention is being directed to this phase of the question which has such vital reactions on the policy of the British empire in regard to India and Ceylon and to our colonies and mandated territories in Africa.

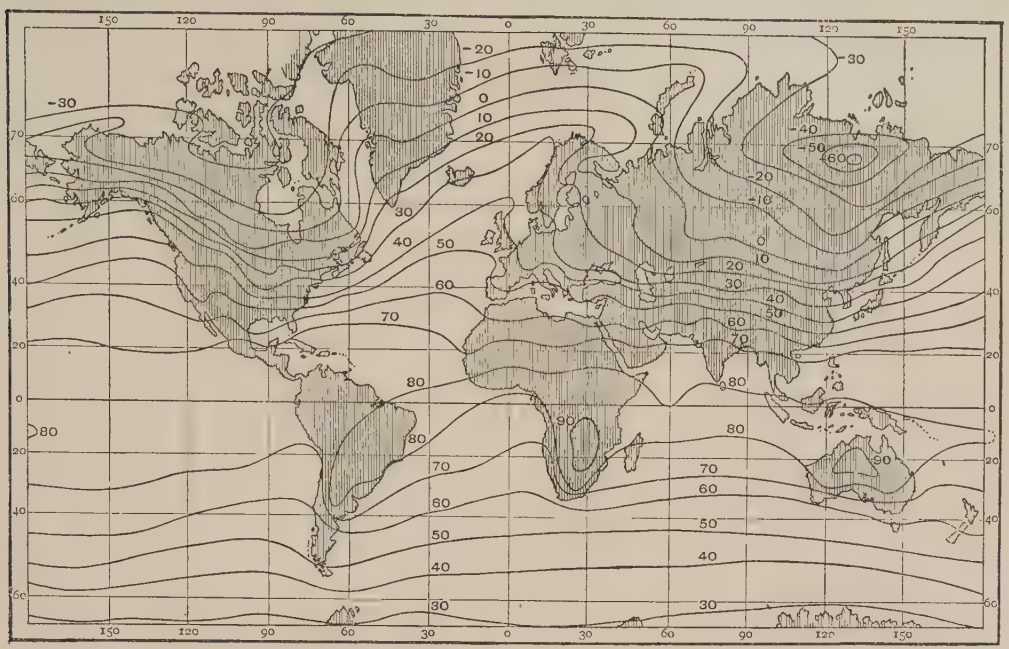
BIBLIOGRAPHY.—(1) Official:—Reports from Select Committees of the House of Commons on Illicit Distillation in Ireland (1812 and 1816), State of Metropolitan Police and Licensed Victuallers (1817), Price and Quality of Beer (1818), Laws relating to Sale of Beer (1830), Beershops (1833), Prevailing Vice of Drunkenness (1834), Certificates for Public-Houses [Scotland] (1846), Wine Duties (1852), Public-Houses (1854), Sunday Sale of Liquor (1855 and 1868), Control, &c., of Habitual Drunkards (1872), Irish Sunday Bill (1877), Sunday Closing Act (1888), British and Foreign Spirits (1891); from Select Committees of the House of Lords on Beer Acts (1847–50), Prevalence of Intemperance (1877–79); from Royal Commissions on Sale [off] of Excisable Liquors (1878), Welsh Sunday Closing Act (1890), Licensing Laws (1896–99), Arsenical Poisoning (1901–3), Sewage [Distilleries] (1909), Poor-Law (1909), Whisky (1909), Selection of Justices of Peace (1910), Divorce (1912), Venereal Diseases (1916); from Departmental Committees on Registration of Clubs (1894), Beer Materials (1899), Physical Deterioration (1904), Industrial Alcohol (1905); from Committee on Canteens and Regimental Institutes (1903); from Advisory Committee on State Purchase (1916); from Liquor Trade Finance Committees (1918). (2) Non-official:—Dr F. R. Lees, *Arguments for Prohibition* (Alliance Prize Essay, 1853); Dr W. B. Carpenter, *Physiology of Temperance and Total Abstinence;* Dr B. W. Richardson, *Cantor Lectures on Alcohol;* Dr F. R. Lees and Dr Dawson Burns, *Temperance Bible Commentary;* William Hoyle, *Our National Resources and how they are Wasted;* Dr Dawson Burns, *Temperance History;* Winskill, *Temperance Workers and the Temperance Movement;* Reports of Committees on Intemperance appointed by Convocations of Canterbury and York; Valpy French, *Nineteen Centuries of Drink;* Robinson Souttar, *Alcohol: its Place and Power in Legislation;* Dr Dorchester, *The Liquor Problem in all Ages;* Rowntree and Sherwell, *The Temperance Problem and Social Reform* (1899); Lees and Raper Lectures (1898 onwards); Dr W. C. Sullivan, *Alcoholism* (1906); Sir Victor Horsley and Dr Mary Sturge, *Alcohol and the Human Body* (1907); George B. Wilson, *Drinking and Drunkenness—a Statistical Review* (Howard Medal Prize Essay, *Statistical Journal*, 1912, and *Alliance Year-Book*, 1913); Sir Lauder Brunton and others, *True Temperance Monographs* (1915); Dr T. N. Kelynack, *The Drink Problem of To-day* (1916); *Alcohol and the Human Organism* (1918; revised 1924); Charles Simmonds, *Alcohol: its Production, Properties, &c.* (1919); Henry Carter, *The Control of the Drink Trade* (1919); Dr Arthur Shadwell, *Drink in 1914–1922* and *Drink and Temperance Legislation;* Dr Ernest H. Starling, *The Action of Alcohol on Man* (1923); Dr C. C. Weeks, *Alcohol in Medical Practice* (1925); Reports of International Congresses on Alcohol—various; *Alliance Year-Books* (1910 onwards). See also the articles ALCOHOLISM, INEBRIATES, LICENSING LAWS, LIQUOR LAWS; and those on notable advocates of temperance as Mathew, Cruikshank, Lawson.

Temperature is the thermal condition of a body which determines the interchange of heat between it and other bodies. Our first ideas of temperature are derived from our sensations of hot and cold. As explained under Heat (q.v.), the effect of adding heat to a body is to make it hotter, unless it is at its melting or boiling point. This rise of temperature is accompanied by volume changes, on which all our practical methods of measuring temperature depend (see THERMOMETER. Now, although the idea of temperature is familiar enough, its true significance is difficult to understand. So-called thermometric measurements of temperature are not measurements in the strict scientific sense of the term. They are simply the comparison of certain other effects which accompany change of temperature in special bodies. A scientific measure of temperature should be independent of any particular substance, and should depend solely upon the fundamental properties of heat itself. This absolute measure of temperature was first given by Lord Kelvin (Sir W. Thomson), who based his system on Carnot's thermodynamic cycle (see THERMODYNAMICS). The kinetic theory of gases (see GAS, &c.) has given us a definition of temperature in terms of the kinetic energies of the molecules. The assumption is that the molecules are free from molecular forces; the conclusion is in agreement with Boyle's, Gay-Lussac's, and Charles's laws. As no gas obeys these laws rigorously, the inference is that intermolecular actions come into play, so that only part of the temperature can be expressed in terms of the kinetic energies of the molecules. The same is true, but in a much greater degree, for liquids and solids, for which as yet no thorough-going kinetic theory has been formulated.

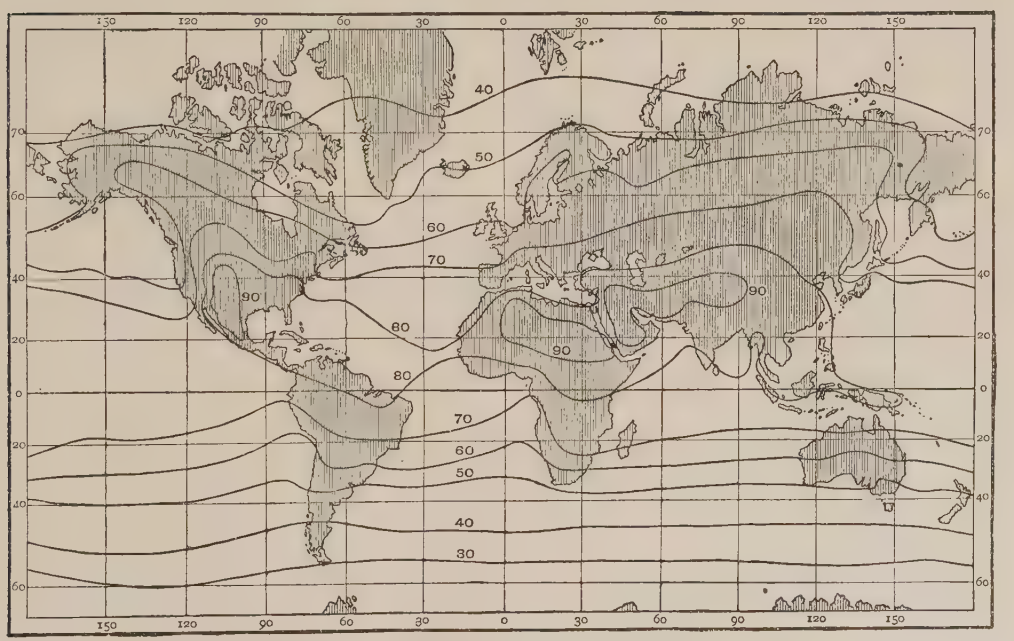
From experiments made by Kelvin and Joule, the absolute zero of temperature was found to be 274 centigrade degrees below the freezing-point of water, or −461° on the Fahrenheit scale. This agrees almost exactly with the value deduced from the kinetic theory of gases. From our present standpoint, therefore, we cannot expect to get a colder temperature. Temperatures down to within 1° C. above absolute zero have been obtained in the Leyden University laboratory by the late Professor Onnes. Guesses have been made from time to time as to the temperature of space, Pouillet, for example, putting it at − 238° F. and Fourier at − 58°. From our present physical outlook, however, the phrase 'temperature of space' is meaningless. Only where matter is can a true temperature exist. A thermometer placed in space will receive radiations from all sides, and the temperature indicated will depend on the power it has to transform these radiations into the irregular motions which constitute heat in a body. An ideal thermometer, transparent to all radiations, and capable only of receiving heat by contact with other bodies, would remain unaffected if isolated in space.

In meteorology the distribution of atmospheric temperature is one of the most important problems calling for discussion. The mean annual temperature over the whole surface of land and sea is perhaps about 45° F. At Verkhoyansk the lowest monthly mean averages − 63·6° F. The highest monthly mean averaged over several years may be set down at fully 110° F., and is experienced in the north-western parts of India, where the thermometer in free shaded air not unfrequently touches 125° F. Loomis in his *Meteorology* gives 133° F. as the highest authentic reading, made in the Great Desert of Africa. Exceptionally high readings made by travellers in Arabian and African deserts must, however, be accepted with great caution. It is indeed no easy matter satisfactorily to measure air temperatures, especially when they are high. It is not enough to shade the thermometer from direct sun rays. It must be shaded as effectually from reflected radiations from earth and sky; and at the same time the air must be free and not confined. To facilitate the study of the distribution of temperature at the earth's surface, it is usual to construct charts of *isotherms*. These are lines, each of which is drawn through all places having the same mean monthly,

mean seasonal, or mean annual temperature. An important series of charts of this character was prepared and published by Dr Buchan in his *Challenger* Report on Air and Ocean Temperatures (1890). Two of these charts are reproduced here on a diminished scale. They show the mean temperature (Fahrenheit) of the globe for January and July, the typical winter and summer or summer



Isothermal Lines showing the Mean Temperature of the Globe for January.



Isothermal Lines showing the Mean Temperature of the Globe for July.

and winter months for all regions on the earth's surface. A glance will indicate how greatly the distribution of land and sea influences the distribution of temperature. In January the great land-areas in the northern hemisphere are much colder than the ocean-areas at the same latitude; in July this relation is reversed. For a full discussion of the facts embodied in these and the charts for the other months of the year, as well as of the related facts referring to barometer pressure, rainfall, humidity, diurnal changes, &c., see the elaborate Report mentioned above. The coldest natural

temperature registered seems to be under −90° F.; temperatures of −85° to below −88° F. have frequently been recorded at Verkhoyansk in Siberia (67° 34′ N. lat. and 133° 51′ E. long.). The lowest temperature ever recorded naturally was a reading of −135° F. or 167° below freezing-point registered during a pilot-balloon ascent at Batavia on 4th December 1913.

The periodic changes of atmospheric temperature are due to the sun. The earth itself has, however, a distinct temperature, which increases at the rate of 1° F. for every 50 or 60 feet of descent through the few miles of crust accessible to us. Upon this real earth temperature the mean annual temperature of the air must to a large extent depend. According to Professor Langley, the surface of the moon with its long 'day' of a fortnight never gets hotter than the freezing-point of water, however brightly it may be shone upon. This shows that the moon is intrinsically much cooler than the earth. On the other hand, it has been calculated that the heat of the earth is not sufficient to raise the temperature of the air more than ¼° C. See also EARTH, CLIMATE, SEASONS, SEA.

TEMPERATURE OF THE BODY.—In the article ANIMAL HEAT the general principles of the subject have been discussed; it remains to consider more in detail the variations of temperature in health and disease. The temperature differs in different parts of the body; it is lower and more variable on the surface of the skin than in internal organs or closed cavities. Observations are usually made with the thermometer held either in the armpit or under the tongue; the latter gives results less than half a degree (F.) higher than the former. In the healthy adult in temperate climates the average temperature in the armpit is about 98·4° F., but undergoes periodical daily variations of nearly a degree in each direction from the mean, being lowest between 2 and 6 A.M., highest between 5 and 8 P.M. A slight rise takes place during the digestion of each meal. In the tropics the temperature is a little higher (less than 1°); it is less diminished in very cold climates. It is slightly higher in childhood, and slightly lower in old age. A persistent elevation or depression of the temperature of more than a degree beyond the limits thus indicated is good evidence that there is some departure from health. In some chronic diseases, especially chronic Bright's disease, diabetes, and myxœdema, the temperature is persistently lowered; in the last it may be as low as 95°. But elevation of temperature is of much more common occurrence and much more important. It occurs in connection with all acute inflammations and all febrile diseases; and careful observations of its degree and its changes from day to day or hour to hour afford one of the most reliable guides to the diagnosis of many diseases, and the estimation of their severity and probable result. Generally speaking, a temperature of 99·5°—101·5° F. may be regarded as slightly febrile; up to 103·5° F. as moderately febrile; up to 106° F. as highly febrile; and above that as hyperpyretic, and, with rare exceptions, as indicative of great danger.

See Wunderlich's *Medical Thermometry*.

Tempering is the process of imparting to steel the desired degree of hardness. Heating above 770° followed by plunging in cold water makes steel hard and brittle. If it is then heated to a more moderate temperature and allowed to cool slowly, it is softened and toughened. Choice of temperature will depend on the character of the steel and the qualities suitable for the purpose in view. An old method of judging temperatures is by the colour produced, which ranges from yellow up through brown and purple to blue. See ANNEALING.

Templars, a famous military order, which, like the Hospitallers and the Teutonic Knights, owed its origin to the Crusades. In the year 1119 two comrades of Godfrey de Bouillon, Hugues de Payen and Geoffroi de Saint-Adhémar, bound themselves and seven other French knights to guard pilgrims to the holy places from the attacks of the Saracens, taking before the patriarch of Jerusalem solemn vows of chastity, poverty, and obedience. King Baldwin II. gave them for quarters part of his palace, which was built on the site of the Temple of Solomon close to the church of the Holy Sepulchre. Hence they took their name as Templars (*pauperes commilitones Christi templique Salomonici*), and the houses of the order, as at Paris and London, that of the Temple. At the Council of Troyes (1128) Bernard of Clairvaux drew up its rule in seventy-two statutes, substantially the groundwork of the statutes as finally revised in the middle of the 13th century. The order at first consisted of knights alone, but later its members were grouped as knights, all of noble birth, chaplains, and men-at-arms (*fratres servientes*), besides mercenaries, retainers, and craftsmen affiliated, and enjoying its protection. The knights took the vows for life or for a certain period, and they alone wore the white linen mantle, with the eight-pointed red cross on the left shoulder (granted by Pope Eugenius III.), and white linen girdle; black or brown garments were worn by all others. The seal of the order showed the Temple, later two riders—a Templar and a helpless pilgrim—on one horse. The discipline of the order was austere, excluding all needless luxury or display in food, dress, or armour, and all worldly pleasures were forbidden—hawking and hunting all animals, with the characteristic exception of the lion. Married brethren were admitted, but no woman might enter the order, and all brethren were enjoined to shun the kiss of woman, even of mother or sister. The beard was worn, the hair cut short, and all slept alone in shirt and breeches, with a light constantly burning. At the head of the whole order stood the Grand-master; under him Masters, Grand Priors, Commanders, or Preceptors ruled the various provinces of Jerusalem, Tripoli, Antioch and Cyprus, Portugal, Castile and Leon, Aragon, France and Auvergne, Aquitaine and Poitou, Provence, England, Germany, Italy (Middle and Upper), Apulia and Sicily. Second in command to the Grand-master stood the Seneschal, his deputy; next the Marshal, whose business, moreover, was to provide arms, horses, and all the material of war. Visitors-general conveyed the commands of the Grand-master and convent or chapter of Jerusalem to the various provinces, exercised discipline, and settled disputes. The Prior or Preceptor of the kingdom of Jerusalem, also styled 'Grand-preceptor of the Temple,' was also general treasurer of the order. The Drapier had general charge of the clothing; the Standard-bearer (*balcanifer*) bore the glorious *bauséant* or war-banner (half black and half white, with the legend, *Non nobis, non nobis, Domine, sed nomini tuo da gloriam*) to the field; the Turcopilar commanded the Turcopoles, a body of light horse, natives of Syria and Palestine, in the pay of the order; the Guardian of the Chapel (*custos capellæ*) had charge of the portable chapel and the appurtenances of the altar, always carried into the field. The Templars were, by a papal bull in 1172, rendered independent of the authority of the bishops, owning allegiance to the pope alone, the immediate bishop of the entire order; and, moreover, they were allowed to have chaplains within their own ranks to whom they might confess, to erect oratories for divine worship within their bounds, and to enjoy exemption from all taxes and tithes, and from interdict. Their houses

enjoyed right of sanctuary, and they often preserved the treasure of kings and nobles.

The Templars, at once knights and monks, realised the two dearest of mediæval ideals, and men of the highest courage and purest devotion flocked into their ranks, bringing with them their wealth to fill their coffers. Already by 1260 the order is said to have numbered 20,000 knights, and these perhaps the finest fighting men the world has seen. Never in the history of the world did men fling away their lives more gloriously for a hopeless cause; never did a Templar play the coward in the hour of danger, nor, when all hope was lost, barter his soul to a Moslem conqueror in return for his life. Charges of pride, of immorality and impieties, of secret heresies, and even of betraying Frederic II. to the infidel (1229) and St Louis to the Soldan of Egypt (1250) were yet to be hurled against the order; never, from the beginning to the end of their two centuries of history, was a Templar charged with cowardice before the enemy. It was their proud boast that 20,000 of their number perished for the cause in Palestine; of their twenty-two Grand-masters seven died on the field of battle, five of their wounds, one of voluntary starvation a prisoner in the hands of Saladin. The most famous successors of Hugues de Payen (died 1136) were Bernard de Tremelai, who fell at Ascalon in 1153; Eudes de Saint-Amand (died 1179), who won a glorious victory over Saladin at Ascalon (1177), only to fall next year into the sultan's hands after a disastrous battle; Gerard de Riderfort, who suffered a terrible defeat near Nazareth in 1187, a second at Hittin two months later, and died in battle under the walls of Acre in 1189; Robert de Sable, who aided Richard Cœur de Lion to gain a glorious victory in the plain of Arsouf (1191), and bought from him the island of Cyprus, which was soon transferred to Guy de Lusignan, whereupon Acre became the seat of the order, the famous stronghold of Pilgrim's Castle being built, whose stupendous ruins exist to this day; Peter de Montaigu, whose courage helped to take Damietta in 1219; Hermann de Perigord, who rebuilt the fortress of Safed; Guillaume de Sonnac, slain beside St Louis at the Nile in 1250; Thomas Berard, an Englishman, under whom Safed was lost in 1266, Jaffa and Antioch in 1268; and Guillaume de Beaujeu, who lost Tripoli in 1290, and fell in the bloody capture of Acre in 1291. The remnant of the Templars sailed to Cyprus, and the latest dying gleams of the order's vigour in the East were the rash attempts to capture Alexandria (1300), and to establish a settlement at Tortosa (1300–2) under the last and most ill-fated of its grand-masters.

The Templars had failed in their work; their usefulness was past; the order had now only to sink into extinction in one of the darkest tragedies of history. Their wealth and pride had sowed a harvest of fear and hatred; their loyalty to the pope and their exceptional privileges had long since aroused the jealousy of the bishops; their bitter quarrels with the Hospitallers, which blazed into open warfare in Palestine in 1243, had shocked the moral sense of Christendom; and the exclusiveness and secrecy with which all their affairs were conducted opened a door for all manner of sinister suspicions among the populace. Philip the Fair of France was a king who covered with a thin veneer of piety a character of complete unscrupulousness; he had succeeded in placing Clement V., a miserable creature of his own, upon the papal throne (1305), and in his minister Guillaume de Nogaret and the officers of the Inquisition he found servants of character unscrupulous as his own. His unfortunate Flemish wars had brought him into desperate financial difficulties, and his treasury was now completely exhausted in spite of extortionate taxation, a shameful debasement of the currency, and the merciless plunder of the Jews and the Lombard bankers. In the wealth of the Templars he saw a tempting prize, and the train of treachery was soon complete. Doubtless their numbers and even their wealth are enormously exaggerated by historians; Schottmüller assumed that in France alone there were 15,000 brethren, and over 20,000 in the entire order; Lea thought that at the end there may have been as many as 1500 knights. The Grand-master, Jacques de Molay, was summoned from Cyprus by the pope in 1306; he came, bringing with him the treasure of the order, and awaited his fate in France. On the 13th October 1307, which Döllinger in one of his latest lectures calls an outstanding *dies nefastus* in human history, the Grand-master and 140 Templars were seized at the Temple and flung into prison. Two degraded Templars supplied some of the charges the king required; tortures, infamous beyond the infamies of the Inquisition, provided the remainder. A habitual denial of Christ, spitting upon the cross, the worship of hideous images, travesty of the holy communion and of the sacrifice of the mass, sorceries, unnatural lusts, *oscula inhonesta* and other indecencies—such were the confessions suggested to and wrung from men racked by the agonies of inhuman tortures to which as many as thirty-six knights succumbed in Paris alone. In August 1308 Clement sent throughout Christendom the 127 articles of interrogation for the accused, and evidence in detail self-contradictory beyond all parallel was quickly accumulated. In the 225 witnesses sent to the papal commission (1310–11) from various parts of France the depositions, as Lea points out, occur most suspiciously in groups of identity according to the bishops from whose preliminary tribunals they had come. Philip held a so-called national assembly at Tours (May 1308) which obsequiously expressed its approval of the condemnation. The pope now took the formal responsibility upon himself by personally examining seventy-two Templars brought before him, when those who had already confessed under torture confirmed their confessions, knowing well that the penalty of retractation was burning forthwith as a relapsed heretic. The pope contended that the fate of the order as an institution must be submitted to a general council. Meantime, to the public commission appointed to examine into the charges at Paris, to give the order an opportunity of being heard in its defence, and to report there came (March 1310) as many as 546 Templars who offered to defend the order against all the charges—blunt, unlearned soldiers, deprived of their chiefs, and weak with torture, long imprisonment, cold and hunger. Four of these were at length commissioned to be present at the investigation on behalf of the order, when suddenly the commission was startled by the news that the provincial council of Sens was about to sentence without further hearing those Templars who had offered to defend the order as relapsed heretics in regard to their former confessions. On 12th May 1310 fifty-four knights were slowly burned to death, refusing in the midst of the most awful agonies to perjure themselves by false confessions. The commission at once suspended its sittings, but at length, after many delays, on June 5, 1311, transmitted its report to Clement to help the General Council in its deliberations. The closing act in this dreary and tangled drama of papal duplicity was Clement's failure to gain over the Council at Vienne, and the suppression of the order without formal condemnation, by the bull *Vox in excelso* (March 22, 1312). The bull *Ad providam* (May 2) laid it under perpetual inhibition, and transferred its pro-

perty to the Hospital of St John of Jerusalem. The persons of the Templars were handed over to the provincial councils, with the exception of the chiefs of the order, who were reserved to the jurisdiction of the holy see—a vain hope for which they had left their inferior brethren to their fate. At length, on March 19, 1314, Jacques de Molay and the gray-haired Geoffroy de Charney, Master of Normandy, were brought from prison to receive judgment, when, to the dismay of the churchmen and the astonishment of all, they rose and solemnly declared their innocence and the blamelessness of the order. That same day, on the Isle des Juifs in the Seine, they were slowly roasted to death, declaring with their last breath that the confession formerly wrung from them by torture was untrue. A strange tradition asserts that from the stake the Grand-master summoned both the pope and the king to meet him at the bar of Almighty God within a year, and history tells us that within the year both went to their account.

In England the trials were conducted with much less inhumanity, and it was only direct pressure from the pope that persuaded the king to permit torture to be applied. The charges for the most part failed to be established, and most of the prisoners were granted penances and permitted to escape with a formal abjuration, while a fair provision was made for their support. The last Master of the Temple in England, William de la More, died a prisoner in the Tower, to the last maintaining the innocence of the order. The memory of the various preceptories and possessions in England, Scotland, and Ireland survives in place-names; the round Temple Church in London, consecrated in 1185, was restored by the Benchers of the Inner and Middle Temple (1839–42) at a cost of £70,000. In Spain, Portugal, and Germany the order was found innocent; almost everywhere in Italy, save in the case of six at Florence, the charges broke down. Everywhere the larger part of their property was given to the Hospitallers, and even in France the king was in great part forced by public opinion to forego his prey.

The literature almost forms a library; here we can name only Raynouard, *Monumens hist. rel. à la Condemnation des Chevaliers du Temple* (1813); Wilcke, *Geschichte des Tempelherrenordens* (3 vols. Leip. 1826–35; new ed. 1860); Michelet, *Histoire de France* (vol. iii.) and *Procès des Templiers* (2 vols. 1841–51); Havemann, *Geschichte des Ausgangs des Tempelherrenordens* (Stutt. 1846); Loiseleur, *La doctrine secrète des Templiers* (1872), an ingenious but unreliable work; Merzdorf, *Geheimstatuten des Ordens der Tempelherren* (Halle, 1877), a work not to be trusted; H. de Curzon, *La règle du Temple* (1886), the most reliable book on this part of the subject; Konrad Schottmüller, *Der Untergang des Templer-Ordens* (2 vols. Berlin, 1887), the most thorough-going of later apologies, and perhaps the best work on the subject; Hans Prutz, *Entwicklung und Untergang des Tempelherrenordens* (Berlin, 1888), the most learned of more recent attacks upon the order, but marred by laborious attempts to construct a preposterous case of Catharist heresy. Ranke (*Weltgeschichte*, 8 Theil, 1887) follows Hammer-Purgstall (*Die Schuld der Templer*, 1855) in thinking that the order had fallen away from Christian faith, and adopted a body of secret and heretical doctrine, which had originated in their contact with Islam in the East; but, as Döllinger points out (*Akademische Vorträge*, vol. iii., Munich, 1891), he is hesitating and cautious, and makes many reservations, while he was evidently not acquainted with the most recent works on the subject. In English there are Addison's excellent *History of the Knights Templars, the Temple Church, and the Temple* (2d ed. 1842); Haye's *Persecution of the Knights Templars* (Edin. 1865); Froude's three interesting but superficial lectures (*Good Words*, 1886; reprinted in *Spanish Story of the Armada*, &c., 1892); and especially Henry C. Lea's admirable *History of the Inquisition* (vol. iii. 1888), which argues for the innocence of the order. Similar in view are Gmelin's *Schuld oder Unschuld des Tempelordens* (Stuttgart, 1893) and H. Finke's *Papsttum und Untergang des Templerordens* (1907).

Temple (Lat. *templum;* cf. Gr. *temenos*, from *temnein*, 'to cut off,' and so 'set apart'), a place or building dedicated to the worship of a god or gods, and amongst most peoples rendered impressive by the noblest architecture and richest adornment available. The history of Greek temple-building is largely the history of Greek Architecture, and is discussed at that head. See also the articles on OLYMPIA, EPHESUS, ATHENS, &c. For other than Greek temples, see ROMAN ARCHITECTURE, PANTHEON, ROME; INDIA (*Architecture*), PAGODA, ELEPHANTA, ELLORA; BURMA (*Architecture*); EGYPT (*Religious Monuments*), EDFU, ABU-SIMBEL, PHILÆ; CHINA (p. 183), PEKING; BAALBEK, PALMYRA; BORO BUDOR; TEOCALLI, &c., where notices and illustrations of many types of temple will be found.

The Temple of Jerusalem has quite exceptional interest for us. When David brought the ark of Jehovah to Jerusalem, he pitched a tent for it within his citadel, and offered sacrifices before it. The *Temple of Solomon* replaced this temporary sanctuary, and in like manner consisted essentially of a chamber to contain the ark, and a court in front for the worshippers and their sacrifices. This was the common type of ancient temples, especially in Phœnicia, save that in them the place of the ark was taken by a sacred cippus ('pillar') or image. It was therefore natural that the Hebrew king, whose own subjects were unskilled in architecture, should send to Hiram, the great temple-building king of Tyre, for architects and workmen, and that the plan and decoration of the new sanctuary closely followed Phœnician models. The 'house,' as was often the case in greater temples, consisted of two divisions—the adytum, 'oracle,' or chamber of the ark, and an antechamber, in which stood the table of showbread, ten candlesticks of gold, and other articles of sacred furniture. The former was a cube of 20 cubits, or 30 feet; the antechamber had the same breadth, but was 40 cubits long and 20 high. In front of this again was a portico 10 cubits deep. Both the oracle and the outer chamber had folding-doors; the inner walls were lined with cedar and richly overlaid with gold, the motive of the ornament being the Phœnician cherub and palm-tree. Two cherubs with outstretched wings stood in the adytum and formed a sort of baldachin over the ark. There were windows in a sort of clerestory that rose above the triple tier of small chambers by which the main building was encased on all sides except the front. Of the façade we have no account. In front of the porch stood two pillars of bronze, 18 cubits high, with lotus-shaped capitals. Similar free-standing pillars are seen on coins in front of the temple of Paphos, and the same feature reappears in other eastern temples. We read of an inner and an outer court; the former was the proper court of the temple, the latter was the court of the palace as well as of the sanctuary, which thus presented itself as essentially the royal chapel. Later kings of Judah made considerable changes in and about the temple; thus Jer. xxxvi. 10 speaks of a 'new gate' in the 'higher court,' which is perhaps the same with the 'new court' of 2 Chron. xx. 5. Solomon's temple was burned by Nebuzaradan, Nebuchadnezzar's general, in the year 586 B.C.

The Temple of Zerubbabel, completed in 516 B.C., after long efforts and much discouragement, was designed, according to Ezra, vi. 3, to exceed the old in magnitude. But whether the dimensions there specified (a breadth and height of 60 cubits) were actually attained seems doubtful in view of Hag. ii. 3. In this temple, as in that of Herod, the

folding doors of the adytum were replaced by a veil or curtain; the altar in front of the house was a great platform of stone; the furniture was inferior in splendour; the ark was wanting; and there was only one golden candlestick. In the course of time a multitude of subordinate buildings grew up round the 'house,' in accordance with the requirements of a more elaborate priestly ritual. The circuit was fortified; and the approach to it from the higher ground on the north-west was further covered by a citadel, called the Baris. At the time of Pompey's siege (63 B.C.) the temple complex was an almost impregnable stronghold, strengthened on its weakest side (to the north) by great towers and a deep ditch.

The Temple of Herod, commenced by Herod the Great in the eighteenth year of his reign (20–19 B.C.), was new from the foundations and, with its outer courts and surrounding colonnades, covered double the old area. To form so large a level space on the hill-top of Zion enormous substructures were necessary, except along the east side, where the colonnade rested on old works ascribed to Solomon, and was accordingly known as Solomon's porch (John, x. 23; Acts, iii. 11; v. 12). According to Josephus, the southern and eastern colonnades were each a stadium, or 600 feet, in length, and the whole circuit of the plateau, including the citadel of Antonia, which stood at the north-west corner, and replaced the Baris, was six stadia. The citadel, which was occupied by the garrison, was of course not holy ground; but neither was the adjacent temple enclosure, connected with the Antonia by a flight of stairs, and usually called the 'outer court,' or, by modern writers, the Court of the Gentiles. Besides its porticos or colonnades, the outer court had various buildings connected with the priestly service, and also contained, near one of the western entrances, the council chamber of the Sanhedrin. It was here too that the money-changers and dealers in articles required for sacrifice had their tables and stalls. Towards the centre of this temple enclosure was a quadrangular platform, lying east and west—the 'inner court.' This, according to Josephus, was surrounded on all sides by walls, of which the external height was 40 cubits, and the internal 25 cubits, its floor being thus 15 cubits above the level of the outer court. On three sides it was surrounded by flights of steps; and the whole was cut off from the rest of the enclosure by a stone balustrade, 3 cubits high, with pillars at regular intervals bearing Greek and Latin inscriptions forbidding the alien to pass on pain of death. The eastern wall of this inner court was pierced by one gate; the north and south walls had four each; the west wall was unbroken. The eastern gateway was exceptionally splendid. Its doors were made of 'Corinthian brass' and not merely overlaid like the others with silver and gold. They were the gift of a certain Nicanor, a wealthy Jew of Alexandria, after whom the gate was named the 'Nicanor Gate.' It is undoubtedly to be identified with the 'Beautiful Gate' of Acts, iii. 2. The eastern and smaller portion of the inner court was walled off from the rest and known as the Court of the Women. The larger western portion, the Court of the Men (of Israel), stood on a somewhat higher level, and, besides having gates of its own on the north and south, was entered from the Court of the Women by a large gate, which some writers prefer to regard as the 'Nicanor' or 'Beautiful' gate above mentioned. The inner court was colonnaded all round, and there were chambers or 'treasuries' against the inner wall. In the middle of the Court of the Men stood the temple proper, again on a higher level, reached by a flight of twelve steps. Its ground-plan was the same as that of Solomon's temple, but its height, obviously with a view to harmony with the larger surroundings, was greater (60 cubits?), and the porch was 100 cubits broad and 100 cubits high. The 'holy place' (as it is usually called) contained the candlestick with seven lamps, the table of showbread, and the altar of incense; the 'holy of holies,' separated by an exceedingly thick and heavy veil, was empty. In front of the fane was the stone altar, 50 cubits square and 15 high, according to Josephus; but the Mishna gives the more probable dimensions of 32 cubits square at the base, narrowing by stages to 24 at the top, with a height of 10 cubits. Round temple and altar ran a stone fence, about a cubit in height, which marked off the so-called Court of the Priests from the area accessible to the laity. The fane proper was completed eighteen months after its commencement, but the 'building' of Herod's temple in the larger sense of the word was still in progress when Jesus began his ministry (John, ii. 20), and was not in fact finished till the procuratorship of Albinus (62–64 A.D.). The whole was burned to the ground when Jerusalem was taken by Titus (August 70 A.D.).

Those scholars who accept Josephus' measurements (he wrote from memory and some years after the temple had been destroyed) necessarily hold that the temple enclosure occupied only a portion of the present Haram area, which measures about 1600 feet from north to south, with a breadth of some 920 feet. Others, however, regard Josephus' figures as much too small, and, broadly speaking, consider that the whole of the Haram area was levelled up by Herod. It is agreed on all hands that the south-west angle of the Haram area is the south-west angle of Herod's temple, and that the line of the west wall of that area is the west wall of the temple, or of the temple and Antonia. Almost all recent authorities are further agreed in holding that from first to last the altar of burnt-offering stood on the so-called Sakhra or sacred rock, now covered by the building known as 'The Dome of the Rock,' to the west of which rose the successive temple-buildings. Two of the most important data for the modern topographer seem to be the arch known as Robinson's arch at the south-west corner, and that known as Wilson's arch, 600 feet to the north of it; they seem to correspond to two of the four entrances on the west mentioned by Josephus. The best judges, such as Petrie, believe that nothing older than Herod is found in the extant western walls and substructures. Of other supposed data it is to be observed that, if Josephus' measurements are correct, the arch substructures on the south, known as 'Solomon's Stables,' are post-Herodian; on this view they are to be identified with the substructures of Justinian's church mentioned by Procopius. The so-called 'Golden Gate' in the eastern wall of the Haram area is certainly in its present form post-Herodian.

See De Vogüé, *Le Temple de Jérusalem* (1864); Fergusson, *The Temples of the Jews* (1878); Thrupp, *Antient Jerusalem* (1855); the publications of the Palestine Exploration Fund; and the arts. 'Temple' by Robertson Smith in the *Ency Brit.*, 9th ed. and Kennedy, 11th ed., Witton Davies in Hastings's *Dictionary of the Bible*, and Benziger in the *Ency. Biblica;* Waterhouse in Sanday's *Sacred Sites of the Gospels* (1903); G. A. Smith, *Jerusalem* (1908). See also the article JERUSALEM.

Temple. See INNS OF COURT, TEMPLARS.

Temple, FREDERICK (1821–1902), from 1896 Archbishop of Canterbury, was born the son of an officer, at Leukas in the Ionian Islands. He was educated at Tiverton and at Balliol College, Oxford, where in 1842 he graduated double-first, and was subsequently fellow and tutor of his college. Successively principal of Kneller Hall

Training College, inspector of schools, and headmaster of Rugby, he became conspicuous in the theological world in 1860 as author of the first of the *Essays and Reviews* (q.v.). In 1868–70 he supported the disestablishment of the Irish Church, and was in 1869 consecrated Bishop of Exeter—a Broad Church successor to the High Church Dr Phillpotts (q.v.)—in spite of strong clerical opposition. An admirable administrator, he was promoted to the see of London in 1885, and to that of Canterbury in 1896. His *Sermons preached in Rugby Chapel* appeared in 1861; he was Bampton lecturer in 1884, and took an active part in temperance reform.

Temple, Richard Grenville, Earl (1711–79), elder brother of George Grenville (q.v.), is mainly known as having from 1752 to 1761 held office under the elder Pitt, who had married his sister; as having bitterly opposed Bute; and as having broken with Pitt (Chatham) on the question of the Stamp Act in 1766, soon after which time he ceased to take any prominent part in public affairs.

Temple, Sir William, diplomatist and essay-writer, was the eldest son of Sir John Temple, Master of the Rolls in Ireland, and of Mary Hammond, sister of the well-known royalist divine, and was born at Blackfriars in London in 1628. He studied two years at Emmanuel College, Cambridge, where he had Cudworth for his tutor, but at nineteen went abroad on his travels, falling in love with Dorothy Osborne (1627–95) in the Isle of Wight on his way to France. His own father sat for Chichester in the Long Parliament, while Sir Peter Osborne was governor of Guernsey and a strong royalist, and naturally disliked the match. But the lovers were constant in their affection, and their seven years of separation gave opportunity for those delightful letters of Dorothy's, the charm of which defies the touch of time. Temple travelled in France, Spain, and Holland, married Dorothy in January 1655, lived some years in studious retirement in Ireland, and was returned for Carlow to the convention parliament at Dublin in 1660. Three years later he settled finally in England; in 1665 was sent on a secret mission to the Bishop of Münster; and on his return was created a baronet and appointed resident at the court of Brussels. His most important diplomatic success was the famous treaty of 1668, known as the Triple Alliance, by which England, Holland, and Sweden united to curb the ambitious schemes of France. This negotiation was accomplished in five days, in conjunction with the great Dutch statesman De Witt, but was rendered vain through the treachery of Charles II. in the secret Treaty of Dover (1670). Temple also took part in the congress of Aix-la-Chapelle (May 1668), and soon after was appointed ambassador at the Hague. He had his share in the long congress at Nimeguen, and was recalled in June 1671 a few months before the beginning of the shameful war between England and Holland. By the Treaty of Westminster (February 1674) Temple ended the war, and, after declining both the embassy to Spain and the secretaryship of state, went again ambassador to Holland. In 1677 he assisted in bringing about the marriage of the Prince of Orange with the Princess Mary. Charles II. in vain offered him again the secretaryship of state; and in the confusion of the Popish Plot accepted his proposed constitutional remedy of a reformed privy-council of thirty persons, by whose deliberations to be guided in all public affairs. As might have been foreseen, so numerous a council, under such an unprincipled sovereign as Charles II., and in times of such fierce faction and widespread corruption, proved an utter failure. For some little time an inner council of four—Temple, Halifax, Essex, and Sunderland—attempted to control public business, but Temple, who was too honest for his fellows, soon felt himself being ousted even from this, and retired to his villa at Sheen, where he lived till 1686, thereafter at Moor Park in Surrey.

When the Revolution placed William III. on the throne Temple was again offered the secretaryship of state, but again refused. His son, the sole survivor of seven children, was made secretary for war, but a week after drowned himself in the Thames, his mind being unable to bear the burden of responsibility. The remainder of his days Temple gave to letters and to gardening. The king occasionally consulted him, and during great part of this period he had with him as his secretary young Jonathan Swift, who regarded his stately self-complacent patron with more fear than affection, but ultimately became his literary executor. Temple died at Moor Park, January 27, 1699, and was buried beside his wife in Westminster Abbey, his heart beneath the sun-dial at Moor Park.

As a writer Temple is now known chiefly by his historical *Memoirs* (1691, 1709) and his *Miscellanea* (1679, 1692), a collection of essays on various subjects—government, trade, gardening, heroic virtue, poetry. The second part contains the essay 'Upon the Ancient and Modern Learning,' which opened the famous controversy on the Letters of Phalaris. Temple has been considered one of the reformers of English style—'the first writer,' says Dr Johnson, 'who gave cadence to English prose.' His style wears a singularly modern air, and is smooth, flowing, and agreeable. 'What can be more pleasant,' says Charles Lamb, 'than the way in which the retired statesman peeps out in his essays, penned in his delightful retreat at Sheen? They scent of Nimeguen and the Hague. Scarce an authority is quoted under an ambassador.' Temple's pretensions to learning are merely amusing, and he has little real weight as a political writer, but he expatiates very pleasantly on foreign travel and country life, on flowers and fruits, on parterres, terrace-walks, and fountains. His epicurean temperament is happily and characteristically displayed in the last words of his last essay: 'When all is done human life is at the greatest and best but like a froward child, that must be played with and humoured a little to keep it quiet till it falls asleep, and then the care is over.'

His collected works fill 4 vols. (1814). The older Lives by Boyer, Swift, and Temple's sister, Lady Giffard, were superseded by the elaborate *Memoirs* by Thomas Peregrine Courtenay (2 vols. 1836), reviewed by Macaulay in a well-known and brilliant essay. The *Letters* of Dorothy Osborne, seventy-one in number, written during the last two years of their seven years' courtship, were edited in 1888 by Judge Parry, who, after suppressing a rival issue, produced a greatly improved edition in 1903. See also books by A. F. Sieveking (1908), and E. S. Lyttel (1908).

Temple Bar, a London gateway, dividing Fleet Street from the Strand, at the boundary of the City. Rebuilt after the Great Fire by Wren in 1669–73 at a cost of £1398, it was removed in 1878–79, and re-erected in Theobalds Park, Cheshunt, in 1888. Its site is marked by a memorial (1880) surmounted by an amazing griffin.

Templemore, a town of County Tipperary, which takes its name from a commandery of the Knights Templars, and is situated on the river Suir, 8 miles N. of Thurles by rail; pop. (1926) 2230.

Temple Society, a body of German Christians who wait for the second coming of Christ. They separated from the church in Württemberg and formed a separate sect; and many of them settled in Palestine in 1868, establishing colonies at Haifa

(q.v.), Jaffa, Sarona, and near Jerusalem, distinguished for industry, enterprise, and success.

Temporal Power. See POPE.

Temuco, in the province of Cautin, Chile, is a flourishing town, the centre of a fertile agricultural district. It has flour and saw mills. The town is meanly built. Pop. 28,000.

Temujin. See GENGHIS KHAN.

Tenacity is that property of matter by which it resists being pulled asunder. Liquids and gases have no tenacity. In technical language, the tenacity of a substance is the greatest longitudinal stress that it can bear without being torn asunder. For example, steel bars have a tenacity of between 50 and 60 tons weight per square inch, whereas oak has a tenacity of not quite 7. With regard to metals it is found that forging and wire-drawing increase their tenacity. See STRENGTH OF MATERIALS.

Tenant, in English law, means a person who holds lands or tenements under another. The feudal system of landownership, as established in England under the Norman kings, was based on the principle that the land of every subject of the crown was held by him of the crown, or of some superior lord who himself held from the crown. To his lord the landholder was bound to render services by way of return for his enjoyment of the land. The landholder was styled the tenant; and the duties which he owed to his lord—or the relation subsisting between him and his lord—constituted the tenure of the land. In modern times these feudal principles retain little of their former importance. Nevertheless, since, by the theory of English law, all lands are holden, immediately or mediately, of the crown, in which the ultimate ownership of the land resides, no subject can be more than a tenant of land. Whoever, therefore, possesses any interest in any parcel of English land is in the eye of the law a 'tenant'; the lands or other possessions he holds are 'tenements'; and the manner in which they are held is the 'tenure.' A landholder's 'estate' is his interest in the land, of which he is tenant. The words 'tenant' and 'estate,' when used in relation to ownership, are usually associated with other words denoting the extent of the landholder's interest. In English law there developed three systems of landholding —freehold, copyhold, and leasehold. A freeholding was held of the king or some mesne lord by free services, that is, by services free from servile incidents and so worthy the acceptance of a free man. An estate of freehold might be either (1) an estate in fee simple, that is, an estate granted to the tenant and his heirs generally, which, having incident to it the rights of free enjoyment and free disposition, was the most ample estate possible under the feudal principle of tenure; (2) an estate tail (or a fee tail)—deriving its existence from the statute *De Donis* passed in 1285—that is, an estate in which the full inheritance was cut down (*taillé*), being restricted to heirs of the body, or lineal descendants, of the tenant; and (3) an estate for life, that is, an estate granted until the death of some person or the last survivor of several persons. Such an estate, if held for the life of the tenant, is an ordinary life estate; and, if held for the life of some one else, is an estate *pur autre vie.* In course of time there arose, in addition to freehold, the customary tenure known as copyhold, and the right of the copyholder to maintain and recover possession of his holding as against all others became enforceable in law. (See COPYHOLD.) Further, it became common to hold land under a contract with a freeholder that the tenant should have possession of the land for a certain number or 'term' of years. In the older law a tenant for a term of years was regarded as holding possession on behalf of the freeholder as his bailiff. In later times, however, a term of years, meaning not merely the time for which a lease is granted but also the interest acquired by the lessee, was fully protected by law. Accordingly, persons who thus occupied lands under tenants in fee or for life came also to be recognised as tenants—this kind of tenure being described as leasehold or as tenure by lease for years. Land can be held by several persons having simultaneous interests. According to the nature of their interests co-owners are distinguished as joint tenants or as tenants in common. Joint tenants hold collectively a single right of ownership, with the benefit of survivorship or the *jus accrescendi,* in virtue of which, on the death of one of them, the estate in the whole of the land remains to the survivors. Tenants in common, on the other hand, have distinct estates, either of the same or of different quantity, in the subject of common property; and, there being no right of survivorship attached to their interests, on the death of one of them his interest is subject to his will or, if he dies intestate, passes to his representatives as if it were held in severalty.

The law of England as to interests in land has been radically altered as a result of recent legislative changes, culminating in the Law of Property Act, 1925, and other statutes passed in the same year dealing with real property. Under these statutes, which came into operation on 1st January 1926, the only estates capable of subsisting, or of being conveyed or created at law are two in number, namely, an estate in fee simple absolute in possession and a term of years absolute. Such estates, when subsisting or conveyed or created at law, are 'legal estates,' and the owner of a legal estate is an 'estate owner.' All other estates and interests in land take effect as 'equitable interests.' Thus estates in fee tail existing on 1st January 1926 are now entailed interests. While there is no longer any such thing as a legal estate in fee tail, an entailed interest can be created by way of trust in any property, real or personal, and gives the same beneficial interests as were formerly conferred by the grant of an estate in fee tail in land. So an estate for life can now only exist as an equitable interest. Copyhold tenure is abolished and, as from 1st January 1926, every parcel of copyhold land is automatically converted into freehold. After 1925 joint tenancy is the only form of co-ownership which is recognised as regards legal estates; and, after that date, tenancy in common can subsist only in equity.

The words 'tenant' and 'tenancy' are, in popular use, generally applied to the relationship which arises from the hiring of land, houses, or other tenements. (See LANDLORD AND TENANT.) The term tenant is also used in reference to interests in personal property. Thus where a fund is held by trustees in trust for a person for his life, that person is spoken of as a tenant for life of the fund. In Scots law the word 'tenant' is applied only to a lessee under a contract of lease.

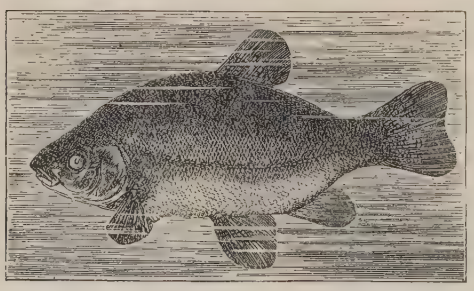
Tenasserim (*Ta-neng-tha-ri*), acquired by Britain after the war in 1825, the southernmost division of Burma (q.v.), is a long narrow strip of territory between the sea and the mountains of the Siamese frontier. Area, 35,788 sq. m.; pop. (1921) 1,613,523. There are six districts, the chief towns being Moulmein, Toungoo, and Tavoy. The town of Tenasserim, which has, through wars and other misfortunes, sunk to a village, stands 33 miles from the sea at the junction of the Great and Little Tenasserim rivers, the former of which has a total course of about 400 miles.

Ten Brink. See BRINK.

Tenbury, or TENBURY WELLS, a market-town of Worcestershire, on the Teme, 22 miles NW. of Worcester. Saline springs were discovered here in 1839, but the place was not developed as a spa until 1911. St Michael's College was founded in 1855 by the Rev. Sir F. Gore Ouseley (q.v.). Pop. 2000.

Tenby, a thriving watering-place of Pembrokeshire, South Wales, 9½ miles E. of Pembroke and 274 W. of London, is finely seated on a rocky headland overlooking Carmarthen Bay. The Cymric *Din-bach y Pysgod* ('fishy little fortress'), it was one of the Flemish colonies planted by Henry I. in Pembrokeshire, and retains a long stretch of its ancient walls, strengthened by Queen Elizabeth in 1588, and a fragment of a castle, whence in 1471 the future Henry VII. escaped to Brittany. Its mild climate, fine level sands, and capital bathing have been the making of the place, which has an interesting Gothic church (1250) with a spire 152 feet high, a colossal marble statue of the Prince Consort (1865), and a fort (1868), now a private residence. The Royal Victoria Pier dates from 1899. Its charter of incorporation was granted in 1402 by Henry IV., and with Pembroke (q.v.) and five other towns it returned one member to parliament till 1918, when it was merged in the county. Pop. (1921) 4854.

Tench (*Tinca*), a genus of fishes of the Carp family (Cyprinidæ), represented by a single species, *Tinca vulgaris*. The thick body is covered with small scales and abundant mucus; there is a short barbel at each side of the mouth; the pharyngeal teeth are in a single row and slightly hooked. The tench lives in lakes and rivers in France, Germany, Austria, and more rarely in England, usually in muddy waters. It is of a deep yellowish-brown colour, more rarely golden or greenish. Instances



Tench (*Tinca vulgaris*).

have occurred of its attaining a length of almost three feet, but a tench of half that length is unusually large. It is very tenacious of life, and, like the carp, can be conveyed to a distance alive in wet moss. It spawns in May and June, depositing its spawn among aquatic plants. The ova are very small and very numerous. In the winter the fish remains dormant in the mud. The flesh is soft and insipid, except when the fish is very well fed, when it becomes delicate and pleasant. Tench are often placed in ponds along with carp. Angling for tench resembles angling for carp.

Tencin, MADAME DE (Claudine Alexandrine Guérin), a clever writer but worthless woman, was born at Grenoble in 1681, and entered the religious life, but soon found its restraints intolerable. Finally, in 1714, she came to Paris, where her wit and beauty soon attracted to her a crowd of lovers, among them personages so great as the Regent and Cardinal Dubois. She had much political influence, was a bitter enemy of the Jansenists, enriched herself, and helped the fortunes of her brother the Cardinal Pierre Guérin de Tencin (1680–1758). But her importance died with the regent and the cardinal in 1723. In 1726 she lay a short time in the Bastille, after the tragic scandal caused by one of her lovers shooting himself in her house. Her later life was more decorous, and her salon became one of the most popular in Paris. She died 4th December 1749. One of her oldest lovers was Fontenelle; D'Alembert was one of her children. Her romances, *Mémoires du Comte de Comminges* (1735), *Le Siége de Calais* (1739), and *Les Malheurs de l'Amour* (1747), show taste, passion, and style, with all the 18th-century limitations. They resemble the romances of Madame de La Fayette in many points, but they lack the peculiar charm that lives in everything written by that admirable woman. Madame de Tencin's *Correspondance* with her brother appeared at Paris in 1790; the *Lettres au Duc de Richelieu* in 1806. See books by Nicolaus (1908), Masson (1909), and De Coynart (1910).

Tender, as a legal term, means the formal offer to perform some obligation incumbent on the person tendering. It is most frequently used in reference to the payment of money which is due. Whenever a tender of the debt is properly made the legal consequence is this, that if the money is refused the creditor will have to pay the costs of any action he may bring to recover it, and cannot claim interest afterwards. In case such an action is brought, the debtor has nothing to do but to plead that he duly tendered the money, and if he then pay into court the sum which he had formerly tendered the other party must stop the action, or continue it at his own risk. In order, however, that a tender should have the above effect, it must have been duly made—that is to say, it must have been made without imposing any conditions on the creditor, and at the proper time and place. The tender must be in money, and not by bill of exchange; but Bank of England notes are a good tender for all sums above £5. Sums not exceeding one shilling may be tendered in bronze coin, and not exceeding forty shillings in silver coin. Though other bank-notes than Bank of England notes are often tendered, the creditor is not bound to accept them; but if he take them without any specific objection, then it will be a sufficient discharge. The gold coinage of colonies may be made current by proclamation; and so might foreign coin. A tender of a larger sum than is due is good, but the debtor may not require change to be given. Nor must any condition be annexed to the tender, not even the condition of giving a stamped receipt; but a person receiving payment is bound to fill up a stamped receipt on its being tendered to him, and to pay the stamp; and his refusal subjects him to a penalty of £10. A tender in payment must, in general, be made to the creditor at the place he has indicated, and it is the duty of the debtor to find out and pay the creditor. It is, however, enough that a tenant be ready to pay the rent on the premises at the time it is due, it being the landlord's duty to send or call for it. In Scotland, Bank of England notes are not legal tender. By the Currency and Bank Notes Act, 1914, the treasury was authorised to issue currency notes for one pound and for ten shillings, which should be legal tender for the payment of any amount. By the same act the notes of Scottish and Irish banks were made legal tender for the payment of any amount in these countries. In the United States all the gold coins are good; and also the silver dollar for any amount, when the contrary is not expressly stated in the contract.

Tendon, the white fibrous tissue reaching from the end of a muscle to bone or some other struc-

ture which is to serve as a fixed attachment for it, or which it is intended to move. Tendons have been divided into (1) *Funicular*, or rope-like, as the long tendon of the biceps muscle of the arm; (2) *Fascicular*, as the short tendon of that muscle, and as the great majority of tendons generally; and (3) *Aponeurotic* or tendinous expansions, sometimes of considerable extent, and serviceable in strengthening the walls of cavities, as, for example, the tendons of the abdominal muscles. The tendons commence by separate fascicles from the end of each muscular fibre, and they similarly terminate by separate fascicles in distinct depressions in the bones, besides being closely incorporated with the periosteum. In some birds whose tendons are black the periosteum is black also. If a tendon is ruptured by an accident, or divided by the surgeon (tenotomy), the two ends, if not too far separated, unite with extreme readiness, by the formation of intervening plastic material, which soon acquires great firmness. The tendons most frequently ruptured are the Achilles Tendon (q.v.) and the tendons of the rectus femoris and the triceps humeri.

Amongst the diseases of tendons are *inflammation* and one of the forms of Whitlow (q.v.) known as *Paronychia gravis*, or *tendinous whitlow*, in which 'the tendons and their sheaths in the finger and hand are the seat of a severe and often most destructive inflammation, which, though often confined to one finger, not unfrequently extends to the hand and arm, attacking not only the tendons and softer parts, but exposing the bones, and disorganising the joints' (Holmes). A permanently bent finger, from adhesion of the tendon to its sheath, is a common result in severe cases of whitlow of this kind. Tendons may also be inflamed as the result of gout or rheumatism, and not very unfrequently they are the seat of syphilitic enlargements or other tumours. Fibrous tumours and small cartilaginous enlargements are often found in tendons.

Tendril, a climbing organ in plants, may be of the nature of leaf or stem, and various parts of the leaf may take the form of tendrils. The tendrils of vines and passion-flowers are stem structures. In Smilax the stipules are tendrils. In *Lathyrus Aphaca*, on the other hand, the stipules are enlarged to perform the usual functions of leaves, while the rest of the leaf is transformed into tendrils. Other species of Lathyrus have a pair or more of ordinary leaflets at the base, the remainder of the leaf being modified for climbing, or merely reduced to a narrow tip. Sometimes the petiole of an ordinary leaf acts as a tendril, as in Tropæolum and Clematis. Even a root may play the part, as in Vanilla. Tendrils are sensitive to contact, and grow more rapidly on the other side from the object touched, whereby they come to coil round it. The part not in contact then throws itself into a double corkscrew form, and draws the plant closer to its support. The corkscrew must of course be double, that is, it must twist in both directions, since both ends are fixed. Some tendrils end in adhesive disks (as Vitis).

Tène, La. See Iron Age.

Tenebræ. See Good Friday.

Tenedos (*Bosdscha Ada*), a Turkish island in the Ægean Sea, off the Troad, and 12 miles S. of the entrance to the Dardanelles. It is 8 miles long and 2 to 4 broad, and is rocky, but not unproductive, and is fairly populous. The treaty of Lausanne (1923) provides for special administration. Tenedos is the chief town. Tenedos figures in the siege of Troy.

Tenerife, Peak of, or Pico de Teide, a famous volcano, only slightly active now, the highest summit in the Canary Islands (q.v.), stands in the south-west of the island of Tenerife, and is 12,180 feet above sea-level. The lower slopes of the mountain are covered with forests, or laid out in extensive meadows, yielding rich grass; but the upper ridges and the Peak, properly so-called, are wild, barren, and rugged in appearance. The Peak El Pitón and its two inferior neighbours, the Montaña Blanca and Chahorra (9880 feet), rise from a rugged circular plain of lava debris and pumice, 7000 feet above sea-level, about 8 miles in diameter, and fenced in by an almost perpendicular wall of rock. From the crevices sulphurous vapours are constantly exhaling. The wall of the crater at the top is formed of broken and jagged porphyritic lava rocks, is elliptical, 300 feet in diameter, and 70 deep. The colour of the whole is white. There is an ice cave at an altitude of 11,000 feet. The Peak can be seen more than 100 miles off. In 1795 and 1798 there was volcanic activity here.

See *Tenerife*, by C. Piazzi Smyth (1858), who made a series of experiments here; Olivia M. Stone (who ascended the peak), *Tenerife and its Six Satellites* (new ed. 1889); G. W. Strettell, *Tenerife* (1890).

Tenesmus (Gr. *teinein*, 'to strain') is the term applied in Medicine to a straining and painful effort to relieve the bowels when no fæcal matter is present in the rectum, the effort being excited by some adjacent source of irritation. It is a common symptom in dysentery, irritation of the bladder, cancer of the rectum, &c.

Teniers, David, the Elder, a Flemish master, was born at Antwerp in 1582. A pupil of Elsheimer at Rome and Rubens at Antwerp, he was admitted to the painters' guild of St Luke in his native city, and died there on 29th July 1649. His subjects are in general homely, the interiors of public-houses, rustic games, weddings, and the like; but they are full of reality, charm of colour, and happy ease of composition.—David Teniers, the Younger, son of the preceding, was born at Antwerp, 15th December 1610. He received his first lessons from his father, and the influence of his own contemporary, Adrian Brouwer, is strongly marked on his earlier work. He rose quickly to distinction, enjoying the favour and friendship of the Archduke Leopold William, Don Juan, bastard son of Philip IV. of Austria, the Prince of Orange, the Bishop of Ghent, and other dignitaries. His first wife was a daughter of the painter Breughel. He was admitted 'master' of the guild of St Luke in 1632, and in 1644 was elected its president by the common council of Antwerp; in 1647 he took up his abode at Brussels, where he died, 25th April 1690. Of his pictures John Smith in his *Catalogue Raisonné* enumerates no fewer than nine hundred. They possess, but in superlative degree, the qualities that mark his father's work. In the tone of his skies, the drawing of his trees, the animation and grouping of his figures, we see everywhere the presence of a richer, finer, more observant and more imaginative genius. None has realised more richly the charm of joyous open-air life. His scriptural subjects alone are unsatisfactory.

See Kugler's *Handbook to the German, Flemish, and Dutch Schools*, remodelled by Waagen, rewritten by Crowe (1874).

Tenison, Thomas, Archbishop of Canterbury, was born at Cottenham in Cambridgeshire, 29th September 1636, studied at Corpus Christi in Cambridge, and after holding several cures was made Bishop of Lincoln by William III. in 1691, and primate of all England three years later. He was a favourite at court, held many important state offices, and attended Mary and William on their death-beds. He crowned Queen Anne and George

I., being a strong supporter of the Hanoverian succession, and died 14th December 1715. His works comprised some anti-papal tracts, sermons, and a criticism of Hobbes.

Tennant, SMITHSON (1761–1815), English chemist, studied medicine at Edinburgh and Cambridge, and became professor of chemistry in the latter in 1813. He was killed by the collapse of a bridge near Boulogne. He discovered osmium and iridium, and wrote a valuable paper, *On the Nature of the Diamond* (1797).

Tennant, WILLIAM, the author of *Anster Fair*, was born 15th May 1784, at Anstruther in Fife. A cripple almost from his birth, he naturally took to reading, and in 1799 went to the university of St Andrews, but was compelled to leave after two years to act as clerk to his brother, a corn-dealer. The business soon failed, and in 1813 Tennant was fain to accept the situation of parish schoolmaster at Dunino, near St Andrews, with a salary of £40 a year. The year before he had published his *Anster Fair*, a poem of much sprightliness and humour, notable as the first attempt to naturalise in our language the gay *ottava rima* of the Italians —soon after to be adopted with splendid success by Hookham Frere and by Byron. A highly laudatory notice of the poem appeared in the *Edinburgh Review* in 1814, from the pen of the then omnipotent Jeffrey. In 1816 Tennant became a teacher at Lasswade near Edinburgh, whence three years later he was transferred to a mastership in Dollar Academy. His attainments as a linguist were extraordinary, and in 1835 he was appointed by the crown to the chair of Oriental Languages in the university of St Andrews. He died near Dollar, 14th October 1848. Tennant never equalled his first poem, although there was no little merit buried with the *Thane of Fife* (1822), *Papistry Stormed* (1827), and even the dramas of *Cardinal Beaton* (1823) and *John Baliol* (1825). See the memoir by Matthew Conolly (1861).

Tennemann, WILHELM GOTTLIEB, historian of philosophy (1761–1819), lectured at Jena, became professor at Marburg in 1804, and wrote, from the Kantian point of view, a *Geschichte der Philosophie* (vols. i.–xi. 1798–1819), and a shorter history (1812), translated as a *Manual of the History of Philosophy* (1852), long a text-book in Britain.

Tennent, SIR JAMES EMERSON, born in Belfast in 1804, studied at Dublin, and after practising at the bar was sent to parliament in 1832. He first supported Earl Grey and then Peel, and was secretary successively to the Indian Board, to the government of Ceylon, to the Poor-law Board, and to the Board of Trade. He was made a baronet on his resignation of the last post in 1867, and died in London, 6th March 1869. He is best known for his great work on *Ceylon* (1859) and books of travels in Greece and Belgium.

Tennessee, one of the central southern states of the American Union, the thirty-fourth in area and nineteenth in population, is popularly called the Volunteer State, and is situated in the Mississippi Valley in 35°—36° 37′ N. lat. and 81° 37′—90° 28′ W. long. On the N. are Virginia and Kentucky, on the E. is North Carolina, on the S. are Georgia, Alabama, and Mississippi, and on the W. the Mississippi River separates it from Arkansas and Missouri. Its mean length is 385 miles, its mean width 109 miles; area, 42,050 sq. m. Politically the state is divided into East, Middle, and West Tennessee, and these sections may rudely serve as natural divisions in describing its surface and physical characteristics, though the variety presented in topography, geology, soil, climate, and the habits and occupations of the people represents the corresponding features of the states by which it is bordered. East Tennessee extends from the Unaka and Smoky Mountains, which form the eastern boundary of the state, to the crest of the Cumberland Plateau. It contains some of the greatest ridges of the Appalachians, and abounds in magnificent scenery. Between the eastern ridges and the plateau stretches a valley region about 100 miles in width, broken by minor elevations and depressions. This valley slopes gradually from the north toward the south, and has an average elevation of about 1000 feet. Along its western edge the plateau rises in a bold wall from 100 to 200 feet high. The tableland has a broad flat top covered in places, especially toward the north, with the superimposed ridges and peaks of the Cumberland Mountains. Its western edge has a ragged contour notched by numerous 'coves' and valleys. The southern end is divided into two arms by a deep gorge with perpendicular sides rising from 800 to 1000 feet above the valley. The Sequatchie River flows through this trough until, near the southern border of the state, it is absorbed by the Tennessee River, which, breaking through the eastern arm, follows the valley for a distance of 60 miles into Alabama. The river then turns, and breaking through the western arm re-enters the state after forming part of the boundary between Alabama and Mississippi. Between the Tennessee River in its northern course and the Cumberland Mountains is Middle Tennessee, presenting a varied landscape of mountains, plains, hills, and valleys. It may be described as an extensive elliptical basin surrounded by an elevated rim. The Cumberland River, which enters the state from Kentucky, flows about 150 miles through the northern central part and then re-enters Kentucky. Between the Tennessee and Mississippi rivers lies the western division of the state. The narrow valley of the former river is skirted on the west by a ridge running north and south across the state. From this divide a rolling plain slopes towards the west, terminating in a steep bluff, beyond which are the alluvial bottom lands of the Mississippi.

Nearly all the geological periods are represented to a greater or a lesser degree, from the ancient metamorphic rocks of the mountains in the east to the recent alluvium of the Mississippi River bottom. Silurian deposits predominate in the mountain-region and in the valley of Middle Tennessee. Surrounding this valley are different groups of Carboniferous rocks, and in the Cumberland Plateau is a part of the great Appalachian coalfield. The coal-measures occupy an area of 5100 sq. m., and the seams are of exceptional thickness. West of the Tennessee River broad strips of Cretaceous and Tertiary deposits cross the state parallel to the alluvial bed of the Mississippi. The deposits of iron ore in different parts of the state are known to be very extensive, and the beautiful marbles which occur in great abundance are widely celebrated. Other minerals of importance are building-stone, copper, zinc, silver, gold, lead, petroleum, barytes, &c. Several famous mineral springs are the resorts of invalids.

The climate is mild and delightful, but marked by variety, which is due to numerous causes arising from geographical position and topography. The average length of time between killing frosts is 200 days. Herbage is often green throughout the year, and cattle generally graze during the winter months. The rainfall is ample, amounting to an average of 52 inches. The soil is very fertile, especially in the western region. Agriculture is therefore the leading industry, but the mining of coal and iron and manufacturing are rapidly growing interests. All the cereals and fruits of the temperate zone flourish in Tennessee. The staple crops are corn, wheat, oats, cotton, and

tobacco, fruit, hemp, pea-nuts, &c. The principal cotton districts are in the south-west and in the southern part of the central basin. Stock-raising, especially the breeding of mules, is extensively carried on. The forests of hard-wood timber constitute a great natural source of wealth. The production of pig-iron has greatly increased, and the number of factories for employing the raw material in the manufacture of machinery, agricultural implements, &c., has been proportionately augmented. There are also many cotton, woollen, flour, and paper mills, besides tobacco-factories and potteries. Within the limits of the state there are about 4500 miles of railroad, while both the Mississippi and the Tennessee are natural highways.

Tennessee contains ninety-five counties, and returns ten representatives to congress. The most important towns are Nashville, the capital of the state, Memphis, the largest city, Chattanooga, and Knoxville. The state has a good system of public schools, normal institutions, and many excellent private schools. The Vanderbilt University is at Nashville, and the headquarters of the University of Tennessee at Knoxville, and there are over twenty collegiate institutions in the state. In 1925 William Jennings Bryan's 'fundamentalist' propaganda resulted in a law forbidding the teaching of human evolution in state-supported institutions; and the trial of a teacher at Dayton drew the eyes of the world upon Tennessee. Hernando de Soto is said to have set foot on Tennessee in the middle of the 16th century, and the French settled for a time beside the Mississippi at the end of the 17th. The first real settlers, however, were the backwoodsmen who crossed the border from Virginia in 1768–9. The most notable of the Tennessee pioneers were James Robertson (1742–1814), John Sevier (1745–1815), and David Crockett (1786–1836). The early settlers asked and received the protection of North Carolina in 1776, and their territory was known as Washington county. In 1785 they organised the state of Franklin, and continued to dispute their rights with North Carolina till 1789, when the territory was ceded to the United States. In the following year territorial government was established, and in 1796 Tennessee became a state. It was the last of the southern states to secede in 1861, and the first to re-enter the Union in 1866. Its constitution was drawn up in 1870. Three presidents of the United States, Andrew Jackson, James Knox Polk, and Andrew Johnson, have come from Tennessee. Pop. (1800) 105,602; (1850) 1,002,717; (1880) 1,542,359; (1900) 2,020,616; (1920) 2,337,885.

See Histories by J. Phelan (Boston, 1888), J. Haywood (Nashville, 1891), E. Albright (1909), Hale and Merritt (Chicago, 1913), Moore and Foster (Chicago, 1923); also Thruston, *Antiquities of Tennessee* (Cin. 1890), and T. Roosevelt, *Winning of the West* (New York, 1895).

Tenniel, Sir John, caricaturist, was born in London in 1820. A self-trained artist, he was selected in 1845 in competition to paint one of the frescoes—Dryden's 'St Cecilia'—in the Houses of Parliament. But to the public he is known, not as painter, but as book-illustrator, and chiefly as the cartoonist of *Punch*. He joined its staff in 1851, and year by year after Leech's death he produced its principal weekly political cartoons, notable not less for their pathos than for their wit, humour, and skilful draughtsmanship. His illustrations to *Alice in Wonderland* and *Through the Looking-glass* are remarkable for their grace, delicacy, and finish; earlier book-illustrations were to *Æsop's Fables*, Moore's *Lalla Rookh*, the *Ingoldsby Legends*, &c. He was knighted in 1893; and published his last cartoon in *Punch*—last of the fifty years series—in January 1901. He died on 25th February 1914.

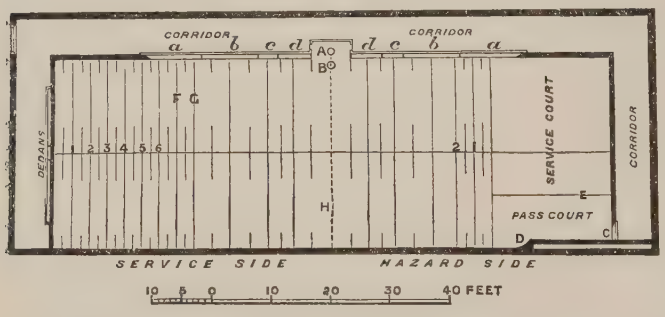
Tennis and **Lawn-tennis.** These ball-games are descended from a handball game (*jeu de paume*) played in the parks and *fossés* of French and Italian châteaux in the middle ages. By the 14th century a form of the game played in enclosed courts was common in France; it was called *courte paume*, and, as distinct from it, the open-air form came to be known as *longue paume*. These two games may be regarded as respectively the forerunners of tennis and of lawn-tennis. At an early date 'paume' would appear to have been introduced into England. The English word *tennis*—also formerly spelled *tennise*, *tennys*, *tenys*, *tennes*, &c.—used as a general equivalent of *paume* would seem to be of old French origin; but no such old French name for the game of *paume* has been discovered. The etymology of the word is uncertain, and many suggestions as to its origin have been offered; perhaps the most acceptable is that the name comes from a presumed cry of *tenez* ('hold' or 'take') uttered by a player as a warning before putting the ball into play. Now the name 'tennis' is held to be properly applied to the modern form of the enclosed *courte paume;* at the same time, so much less widely known and played is this game than lawn-tennis that now probably all but all of those who use the word 'tennis' refer to lawn-tennis—that is to say, to the game whose origin may be traced to the open-air *longue paume*. It is in these circumstances that the enclosed court game is sometimes distinguished as *real tennis*, *court tennis*, *royal tennis*, *close tennis*.

Tennis.—The beginnings of the game have been outlined above. Shortly after the development of an enclosed court game from the *jeu de paume*, a form of racket in place of the hand for purposes of striking was introduced, but the prototype of the modern implement was of so elementary a character that another century elapsed before it superseded hand play. In 1600 Paris is said to have possessed 1800 tennis courts, and in France the palmy period of the game—*le roi des jeux et le jeu des rois*, as it was called—lasted till the time of Louis XIV. The most historically famous tennis court was that of Versailles, in which the French National Assembly met in 1789. The numerous allusions to tennis found in English literature, from Chaucer onwards, prove that the game was played in England from the 14th century. It was the favourite pastime of several of the kings—Henry VIII. was an ardent tennis-player. For a long time indeed tennis became so popular that laws were passed prohibiting it. The expense of building and keeping up a court confined the game to the aristocracy, and during the 18th century the game declined both in England and France. By 1866 there were some 22 courts in England and fewer in France. The game revived considerably during the latter half of the century, numerous new courts being constructed. In London the Queen's Club was opened in 1887 and the Prince's Club in 1888. Tennis lapsed during the Great War, but was taken up enthusiastically afterwards, and both in Britain and in the United States, though not on the Continent, came to enjoy one of the most prosperous periods in its modern history. The game cannot claim, however, to be one that is widely played.

Scarcely two courts in existence are identical in all respects; the dimensions given below are therefore taken from the typical court in Marshall's *Annals of Tennis*. The dedans and corridor are covered by a sloping wooden roof, 7 feet 2 inches from the floor, called the penthouse. The dedans, galleries, and grille are openings in the wall below the eaves of the penthouse. The net is 3 feet high at the centre, 5 feet at the sides. In modern courts the floor is usually constructed of a number of dark grey or red composition slabs, and lighting is

accomplished by side-windows and skylights. The racket consists of a strong hoop of ash tightly strung with gut, with a wooden handle, the whole being 2 feet 2 inches long, and weighing about 16 oz. The ball is made of woollen material covered with white cloth, and weighs 2½ oz. A set of six dozen balls is in use at one time, and a set will last fifty years or more if re-covered and moulded into shape from time to time.

The game may be played by two or four players. The server stands anywhere on the service side of the court and strikes the ball, so that it drops in the service-court after first touching the side penthouse. The striker-out must return it over the net either at the volley or first bound. A player scores a stroke (1) when he hits the ball into a winning hazard, viz. dedans, grille, or last gallery on the hazard side; (2) when his opponent hits the ball into the net, out of court, or loses a 'chase.' The latter term requires some explanation. When



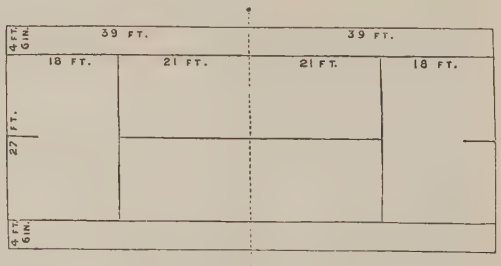
Plan of Tennis Court:

a, *a*, last gallery; *b*, *b*, second gallery; *c*, *c*, doors; *d*, *d*, first gallery. A, marker's box; B, basket for balls; C, the grille; D, the tambour; E, pass line; F, chase, last gallery; G, chase, a yard worse than last gallery; H, net.

a ball falls—i.e. touches the floor for the second time—on or between any of the lines marked across the court, or enters any of the galleries except the winning gallery (the hazard side last gallery), the marker calls out 'chase six,' 'second gallery,' 'better than two,' according as it falls 6 yards from the end wall, in or opposite the second gallery, or between the 1½ and 2 yard lines. When two chases have been made, or one if either of the players is within a stroke of the game, they change sides, and if the striker-out succeeds in making the ball fall nearer the end wall than his opponent had done, he wins the chase. If he makes the same chase it is called "chase off,' and the score is not affected. When a player wins a stroke the score is called '15—love.' His next stroke brings him to 30, then 40, then game. Thus four strokes may win a game, but if both players reach 40 the game is called 'deuce,' and it is necessary to win two strokes more in succession to secure the game. A 'set' is won by the player who first wins six games; if the score, however, is five all, an 'advantage-set' may be played, requiring play to go on till one player is two games ahead of the other. The origin of the method of scoring by fifteens is doubtful. An obvious explanation is that in French courts there were fourteen chases, and so they began scoring at 15 to avoid confusion; but there seems to be conclusive evidence that this system of scoring was introduced before chases were in use. One writer has ingeniously connected it with coinage denominations of mediæval France. Rackets (q.v.) and Fives (q.v.) are cognate games to tennis.

The earliest writer on tennis was an Italian priest, Antonio Scaino (1534–1612), whose *Trattato del Givoco della Palla* (1555) is very rare. There are books written in French by Forbet (1599), Hulpeau (1632), de Garsault (1767), Fournier (1862), de Nanteuil (1898), and in English by Lukin (1822), J. Marshall (1878—a work of importance), J. M. Heathcote (1890), E. H. Miles (1902); and there was published in 1924 an exhaustive *History of Tennis* (2 vols.) by E. B. Noel and J. O. M. Clark.

LAWN-TENNIS.—As has been shown, the forerunner of lawn-tennis is *longue paume*. In France this game is still played, and as 'field-tennis' it was played also in England down to about 1800. The nearer origin of lawn-tennis is to be found, however, in the game of 'sphairistiké,' invented in England in 1874 by Major Wingfield. In principle this game was similar to the lawn-tennis of the present day. Almost immediately it was given the new name of 'lawn-tennis,' and developed in the course of a modification of its details into lawn-tennis as now known. In 1875 a code of rules was drawn up by the Marylebone Cricket Club, and this was revised in 1877 by the All England Croquet and Lawn-tennis Club, on whose courts (since 1922 on a new site) at Wimbledon the annual championships (amateur) have from 1877 been played. In 1888 the Lawn-tennis Association was founded, and this association continues in Britain the controlling body of the game. From the first lawn-tennis enjoyed a great popularity. This progressively increased in the 20th century, the game spreading very rapidly not only in Britain, but also throughout the world, and now of all ball-games lawn-tennis is perhaps the most cosmopolitan, as is evidenced by the diversity of the entry at Wimbledon and by the number of nations annually competing for the Davis Cup, presented as an international trophy in 1900 by D. F. Davis of the United States. An important factor in the popularity of the game is the scope afforded for strategy over and above skill in strokes. The game is played equally by men and by women, the standard of women's play, though inferior to that of men, yet now being very high. The game is predominantly amateur, though in the train of its rapid growth a movement towards professionalism has become apparent.



Plan of Lawn-tennis Court.

Lawn-tennis is played by one ('singles') or two ('doubles') players a side. Broadly the idea of the game is the hitting of a ball (on the volley or before the second bounce) from one player to another over a net into a marked out space, till such time as one of the players, either through the inaccuracy of his own stroke or through the effectiveness of his opponent's, fails to do so, a point then being counted against him. The method of scoring is the same as in tennis (see above). The tactics of lawn-tennis have altered greatly since the time when the game was first played. In early days

play was confined for the most part to the back of the court; then it was found that a volley at the net was a deadly form of attack, and now the doubles game resolves itself for the most part into a contest of volleying, while a similar tendency is apparent in the singles game, only here the greater ease with which the single player may be passed at the net makes necessary a judicious combination of volleying and of back of court play.

Originally the game was played on grass, and still is to a large extent—the championships at Wimbledon are decided on grass—but asphalt, cinders, blaes, and various other substances have been tried. The hard court of red blaes has now come very greatly into favour, as being faster to play upon and more easily kept in playable condition than grass. Covered courts with wooden floors enable the game to be played in wet weather and in winter. The plan and dimensions of a lawn-tennis court are given on p. 36; formerly the court was of hour-glass shape and the service-line was 26 feet, not 21 feet as now, from the net. The net which runs perpendicularly along the ground is 3 feet 6 inches high at the sides and 3 feet in the middle; formerly it was 5 feet at the sides and 4 feet in the middle. For singles the width of the court is 27 feet; for doubles, 36 feet.

A lawn-tennis racket resembles in a general sense that in use in tennis (see above); the construction (size, weight, material, &c.) is wholly unregulated; for men a weight of from 14 to 15 oz. is recommended; for women one of from 12½ to 13½ oz. The balls, made of indiarubber, are filled with compressed air and have an outer covering of white cloth; they are 2½ inches in diameter, and weigh 2 oz. For table-tennis, see PING-PONG.

Of books on the instructional, historical, and other aspects of lawn-tennis may be mentioned those by Heathcote and others (Badminton Library, 1890; new ed. 1903), R. F. and H. L. Doherty (1903), Vaile (1904), Beldam and Vaile (1905), Myers (1908; 1921; *Fifty Years of Wimbledon*, 1926), Wilding (1912), Crawley (1919), Tilden (1920, 1923, &c.), Beamish (1922; new ed. 1926), Ritchie (1922), Parke (1922), Burrow (1923), Hillyard (*Forty Years of First-class Lawn Tennis*, 1924), Suzanne Lenglen (1925), K. McKane (Mrs Godfree, 1925); and see also *Ayres's Lawn Tennis Almanack* (annual).

Tennstedt, a Prussian town 15 miles NW. of Erfurt, with a sulphureous spring.

Tennyson, ALFRED, LORD, was born 6th August 1809, at Somersby, a little village among the wolds of Mid-Lincolnshire. The rector of Somersby was the poet's father, Dr George Clayton Tennyson; his mother, Elizabeth Fytche, being also of a Lincolnshire family. Dr Tennyson was a man of marked physical strength and stature; accomplished in fine art, music especially, and in language; in temperament imaginative, verging at times upon gloom. These conditions, more or less, reappeared in his family. Johnson's pretty phrase about his own college, 'a nest of singing birds,' might be applied to the Somersby parsonage. Alfred was fourth of eight sons, the first of whom died in infancy. His elder brothers, Frederick and Charles, became notable as poets. Frederick Tennyson (1807–98) in 1854 published *Days and Hours;* in 1890 the *Isles of Greece;* in 1891 *Daphne and other Poems.* A notice of Charles (Tennyson) Turner will be found in its place. To the latter Alfred was devoted with a child's warm love and reverence, which break forth tenderly in the *In Memoriam*, and later in the *Midnight* of June 30, 1879, while the *Poems by Two Brothers* (1826) witnessed to that profound early union of heart and soul between the two brothers. Of this little book it will be enough to say that it shows, even if imitatively and immaturely, wide range in subject and varied command of metre. Already in fact, at thirteen or fourteen, Alfred had written a long epic, of which Dr Tennyson, an excellent and well-read scholar, said: 'If that boy dies, one of our greatest poets will have gone'; a paternal prophecy the fulfilment of which perhaps justifies its preservation. Byron at this time was the leading modern favourite of the brothers. At the fatal news from Missolonghi (April 1824) the world seemed at an end to Alfred, who, boylike, commemorated the event by carving upon a sandstone rock—*Byron is dead.*

As the landscape of Warwickshire has been traced in Shakespeare's early work, so in Tennyson's appears that of Lincolnshire; a county far more picturesque than many fancy, in its great contrasts of hill and level, wold and fen. Here was his earliest education through the most susceptible years of life. Near Somersby is Louth, where the brothers found their classical school; near also, Horncastle, where grew up meanwhile for Alfred the hope of youth, the blessing and mainstay of after years.

In February 1828 the 'two brothers' joined Frederick at Trinity College, Cambridge, finding presently a group of friends among whom many fulfilled the promise of their May: J. Spedding, J. M. Kemble, W. H. Brookfield, R. C. Trench, R. M. Milnes, C. Merivale, H. Alford, E. Lushington; and, above all (October 1828), Arthur Henry (born Feb. 1811), eldest son to Henry Hallam, the great historian. Early as he was lost (September 1833), sufficient proof exists of his commanding influence over his most gifted contemporaries, of his singular ability, his depth and tenderness of thought, his beauty of nature. In this genial atmosphere Tennyson's genius rapidly advanced. To this time belong *The Lover's Tale* (written 1827, published 1879), a blank verse rhapsody, and *Timbuctoo*, the poem (also in blank verse) by which he gained the university prize of 1829. Both pieces in general colour and in single phrases anticipate the style by which Tennyson presently became known to the world. After the appearance of *Timbuctoo*, A. Hallam wrote: 'I consider Tennyson as promising fair to be the greatest poet of our generation, perhaps of our century.'

His father's death broke off Tennyson's Cambridge residence early in 1831. In the autumn he made that visit to the Pyrenees recorded in the beautiful *All along the valley.* Meantime his first published volume, *Poems, chiefly Lyrical*, had appeared (1830), followed by a similar small series dated 1833. 'That greatest of persecutions, Silence,' was never his fate; he was now pelted and praised, misjudged and rightly judged—the common lot. But he turned to profit friend and enemy, dropping many less mature pieces, steadily studying and practising an art in which supreme excellence is never dissociated from intensity of labour: poor, and under the cloud of grief for the friend who had passed away in Vienna, 'and beloved of the gods.' To these nine years, spent partly in Lincolnshire, mostly in London, we owe many of his most lovely lyrics; some, the subjects of which were reworked or much expanded in later years. Together with the best of his earlier work, these were published in 1842. Henceforth his place was secure. 'He is decidedly the first of our living poets,' wrote Wordsworth in 1845, 'and I hope will live to give the world still better things.'

1847 brought *The Princess: a Medley*, written in blank verse, almost lyrical in its music; gay and fanciful as *The Midsummer Night's Dream* in plot, yet with the seriousness of life in its underlying chivalrous moral.

The year 1850 was a memorable one in Tennyson's long career. This year, at least, in succession to

Wordsworth, brought him the laureateship; and in this fell the publication of *In Memoriam*, that elegiac treasury in which the poet stored the grief and the meditation of many years after his friend's death; a series of lyrics which in pathos, melody, range of thought, and depth of feeling have been ranked with the *Canzoniere* of Petrarch and the *Sonnets* of Shakespeare. And in June of this year took place his long-delayed marriage with Emily Sellwood, in Shiplake Church, Oxfordshire.

Tennyson and his wife now settled at Twickenham. In 1851 they went through the Riviera to Florence, returning by Milan. In 1852 Hallam, his eldest son, was born; the great funeral Ode upon Wellington was written. By the close of 1853 the passion for his old country life, freedom and peace, and fair English scenery, carried him to Farringford in Freshwater. There Lionel was born (1854); and there, with Sir John Simeon as his highly prized neighbour, and frequent brief journeys interspersed, Tennyson lived uninterruptedly till 1870; having built meanwhile a house for summer and autumn residence (Aldworth), high up on the farther side of Blackdown by Haslemere: at once nearer London, and farther from that intrusion which is one of the penalties paid for fame. Some of these journeys may be recorded; they form no unimportant part of a poet's tranquil life. They included the Western Highlands, Staffa and Iona (1853); Inveraray (1858), to visit the Duke of Argyll, another much-valued friend; Portugal (1859); Cornwall (1860); the Pyrenees again (1861); Derbyshire and Yorkshire (1862); Weimar and Dresden (1865); Dartmoor and Salcombe (1867); North Wales (1869).

Lyrical poetry pure—free from divergence down those 'two byways' (as Schiller named them), the didactic and the rhetorical—in perhaps every one of its forms, had been now set forth by the poet: the lyric of melody, of passion, of description, of travel, of incident, of reflection; the ballad, the personal song, the elegy, the national ode. And the idyll—'that little picture' which has a natural but not exclusive affinity with country life and narrative gently suffused with passion—was also included. It remained for the poet to carry further these modes of song, and to add in particular the drama proper, with the humorous monodramatic presentation of character in rustic forms of speech.

In *Maud: a Monodrama* (1855), Tennyson gave to the personal lyric (for *In Memoriam*, strictly speaking, is elegiac in movement) its deepest and widest extension. As with Hamlet, a taint of mental distraction is supposed to affect the narrator and hero of the drama; leading him to over-colour, through the light of personal feeling, his pictures of the world about him, the politics and manners of the time; whilst the same stress of nature has raised the songs which paint his love-story, in its triumph and its despair, to a sevenfold fire of passionate melodious beauty. Lyrical poetry, unless it were among the Æolic singers of early Greece, had attempted no such scheme as that presented by *Maud;* and the poem may perhaps in popular estimate have suffered the penalty which thoroughly original treatment seldom escapes, for it was relentlessly criticised.

As *Maud* extends the domain of Tennyson's lyrical work in depth of feeling, variety of subject, and area traversed by the narrative, so that 'small picture,' the idyll, epic and historic, tale and character-picture, was treated by him henceforth. To this enlargement witness first the *Enoch Arden* and *Aylmer's Field* of 1864. The poet's power had reached full maturity; his art was perfect. He now took up seriously that Celtic legend which, lacking adequate Teutonic material, England for eight centuries has welcomed as her national epic—our old Arthurian story, to which he had preluded already by a few beautiful sketches; and in 1859 appeared the first four of the twelve *Idylls of the King*, completed by instalments in 1870, 1872, 1885.

Picturesque as the old stories of Arthur (q.v.) and of the Grail (q.v.) became, throughout their many modifications of five centuries and more, they could hardly have been lifted above a poetic-antiquarian interest for Englishmen generally, were their early tone and quality and adventures repeated in modern verse, however accomplished. This difficulty has been felt before with regard to our own and other mediæval romances. Ariosto by skilful serio-comic treatment gave a vitality which is now well-nigh exhausted to the legends of Charles. Spenser turned Arthur and his knights into an allegory, with constant allusion to Elizabethan times. And similarly that *quidlibet audendi potestas* which Horace with absolute right claimed for the poet was everywhere exercised by Tennyson in the *Idylls*. Throughout they are interfused with the vital atmosphere of the Victorian age; and by no other mode could the king return, as it were, and live again in the hearts and souls of men. The fitness of this great change, which presents Arthur not as noble, guilty, and repentant, but as noble, blameless, self-restrained, and far-sighted, is of course fairly debateable. Tennyson has throughout imaged the king as he appeared to the old Welsh historian: 'God has not made, since Adam was, the man more perfect than Arthur.' Nor is it easy to see how the needful central figure for the Arthurian epic, as imagined in its unity by Tennyson, a figure at once human and ideal, could otherwise have been presented; although whether in his picture the delicate balance has or has not been kept may perhaps long remain a fit subject for critical declamation.

The noble *Dedication* (as indeed was already noted in the prelude to the *Morte d'Arthur* of 1842) sets forth the main underlying intention of the *Idylls*. They are a 'new-old' tale, 'shadowing Sense at war with Soul.' This inward conflict is displayed under the guise of the legend how Arthur, through the Round Table (that late mediæval picture of imagined chivalry), the knights and ladies of the court, tries to lead a crusade on behalf of a perfect civilised Christian state; how also, through the sins and selfishness of his followers, the fair Utopia is here never realised. It is a tale, not a mere allegory, although allegory be occasionally introduced; the persons, each in turn, are the mixed human characters of all times.

Most disappointing—and not least so to himself—were Tennyson's incursions into the field of drama. Attracted by the materials of his nation's history he wrote three plays, spread in subject over some four centuries—*Queen Mary* (1875), *Harold* (1877), *Becket* (1884). And with these, certain less important dramas may be named: *The Cup*, founded on a Graeco-Roman tale; *The Promise of May*, a modern domestic piece; *The Foresters* (1892), the poet's own version of the Robin Hood legend.

Dramatic art is, however, hampered by many peculiar laws and limitations; nor is the close air of Victorian civilisation favourable as that of the 16th and 17th centuries to the poetical drama. Nor, again, does the highest gift for character or incident-drawing carry with it necessarily the power to put incident into dialogue, or to make the most of dramatic situations suitable to the theatre. No play of Tennyson's acted during his lifetime (unless with exception of *The Cup*) reached—in England at least—definite popular acceptance. *Becket*, how-

ever, enjoyed considerable success after Tennyson's death. Perhaps the time to estimate their spectacular value has not yet arrived; but meanwhile we may at least say that they form a noble contribution to our history.

A few more volumes, idylls, lyrics, ballads, remain (1880, 1885, 1886, 1889, 1890). Compared with much of Tennyson's earlier work, these, in general, reveal a more mature and certain art, a greatly wider range. History (mostly English); tales in dialect, chiefly that of Lincolnshire; a few beautiful classical pieces; narratives, idyllic and lyrical, of the profoundest pathos; poems treating great problems in religion and morality, philosophy and science—all are included. Among the later volumes were *The Lover's Tale* (1879), *Ballads*, &c. (1880), *Tiresias* (1885), *Locksley Hall—Sixty Years After* (1886), *Demeter* (1889), *The Death of Œnone, Akbar's Dream, and other Poems* (posthumous, 1892). The more decoratively imagined art, frequent in the poet's youthful verse, has now, by natural law, given place to art not less finished but deeper, often darker, in thought. If, compared with *In Memoriam*, a gloomier scepticism is allowed to speak, faith reaches a sweeter and surer creed. Titian, in a word, has made way for Rembrandt.

Tennyson in 1876 once more visited the Pyrenees; in 1878, Ireland; 1882, Lombardy; 1883, Copenhagen; 1887, St Davids and the Channel Islands; 1891, Devonshire.—The losses and the gains of prolonged life he was called on to experience. Besides many among the band of earlier friends, his brother Charles died in 1879; his younger son Lionel, after an honourable career in the public service, in 1886. Hallam, the elder, married Audrey Boyle, grand-daughter to Admiral Hon. Sir Courtney Boyle, one of Nelson's captains, in 1884. And several children of the brothers renewed the charm and sunshine of youth to Aldworth and Farringford. In 1884 the poet-laureate was created Baron Tennyson of Freshwater and Aldworth. He died at Aldworth on the 6th October 1892, and was buried in Westminster Abbey.

Of Tennyson's rank in the hierarchy of Parnassus, when a century or more has gone by, 'the days to come will be the wisest witnesses.' Natural it is, indeed, that the half-century of enthusiastic popularity which Tennyson enjoyed at the hands of his fellow-men should be followed by a period of reaction. But such a reaction is surely but a trying of the metal. It is too much—and far too soon—to say that Tennyson is weighed and found wanting. Rather 'at the balance let's be mute' until we have eyes to see and hearts to understand what is enduring in his work.

The authoritative biography, by the second Lord Tennyson, appeared in 1897. See also other books on Tennyson, and his works by Wace (1881), Van Dyke (5th ed. 1896), Tainsh (1868; new ed. 1893), Jennings (1884; new ed. 1892), T. Davidson (Boston, 1889), Churton Collins (1891), Eugene Parsons (Chicago, 1891), A. Waugh (1892), Ritchie (1892–3), Jenkinson (1892), Jacobs, (1893), Stopford Brooke (1894), Cuthbertson (1898), F. Harrison (1899), Gwynn (1899), A. Lang (1901), Lyall (1902), A. C. Benson (1904), Firmin Roz (Paris, 1912), R. B. Johnson (1913), T. R. Lounsbury (1916), Fausset (1922), Nicolson (1923). For criticisms, see the list in R. H. Shepherd's *Tennysoniana* (1866; new ed. 1879; bibliography separate, 1896). The article by Canon Ainger in the *Dictionary of National Biography* (1898) deserves special mention; also Lady Richmond Ritchie's *Records of Tennyson, Ruskin, and the Brownings* (1892). There are an analysis of *In Memoriam* by F. W. Robertson (1862); a *Key* to it by Dr Gatty (1881; 4th ed. 1891); a *Commentary* on it by A. C. Bradley (1901); *Concordances* by D. B. Brightwell (for the works up to 1869) and A. E. Baker (1914); a *Tennyson Handbook* by Morton (1895), a *Tennyson Primer* by Dixon (1896), and a *Tennyson Dictionary* by Baker (1916). See also A. J. Church's *The Laureate's Country* (1890), J. C. Walter's *In Tennyson Land* (1890), G. G. Napier's *Homes and Haunts of Alfred Tennyson* (1892), and B. Francis's *Scenery of Tennyson's Poems* (1893).

Hallam, second Lord Tennyson (born 1852), was educated at Marlborough, Trinity College, Cambridge, and the Inner Temple, and acted as his father's private secretary. He contributed to the magazines in prose and verse, edited his father's and his uncle's poems, and wrote the definitive memoir of his father (2 vols. 1897). In 1899–1902 he was Governor of South Australia, and in 1902–4 Governor-General of the Commonwealth.

Tenor, in Music, is the higher adult male chest voice (see Voice). The tenor clef (a C clef on the fourth line of the stave) is now little used, the music being usually written an octave above its real pitch, on the treble clef. In early church music the tenor part was the melody.

Tenos, or Tino, a Greek island, one of the Cyclades, 18 miles long. The capital is Tenos, on the S. coast.

Tenrec (*Centetes*), a genus of Insectivora, represented by one species (*C. ecaudatus*), restricted to Madagascar. It is the largest known insectivore, measuring from 12 to 16 inches in length; and it is probably the most prolific of mammals, since as many as twenty-one young are said to have been brought forth at once. The squat body has hardly any tail; the adult males have long canines; the young have strong white spines in lines along the back, but these are afterwards lost.

Tenrec (*Centetes ecaudatus*).

It feeds chiefly on earthworms, and is said to become dormant during the hottest part of the year.

Tent (Lat. *tentus*, 'stretched,' from *tendere*). Tents have been used since very early times as an advance upon cave-dwellings, especially amongst nomadic tribes. The skins of animals, or leaves, or bark formed the earliest coverings, textile fabrics being substituted as civilisation advanced. Bible patriarchs always dwelt in tents, probably much the same as the modern Arab tents, which are large structures, very rude in form and of small height, but covering a considerable area. The covering is felted goat-skins. The Jewish Tabernacle was a large tent, and had a covering of rams'-skins and badgers'-skins (new translation, seal-skins or dugong-skins. Nineveh sculptures show Sennacherib's tent, like modern tents supported by ropes. The manufacture of goatskin tents was an established industry in the time of St Paul, who took part in it. The early Greek tents were made of skins, each accommodating two soldiers. Alexander the Great is said to have had a pavilion of extraordinary magnificence. Its roof, one mass of gilded embroidery, was sustained by eight pillars covered with gold. In its centre was the royal

throne; and a hundred beds could be made up within it. The Roman tent was made of canvas or some such material, supported by two upright posts carrying a ridge pole. Each held ten soldiers with their *decanus* or corporal. In Persia many tribes live entirely in hemispherical felt tents much decorated and with handsome door hangings. Chinese tents are usually of matting, of great size, and often very comfortable. The American Indians' wigwam is a conical tent of bark, mats, or skins on poles. The tents of gypsy tent-dwellers are stretched on rods bent into hoop shape. Like canoeing and caravaning, camping out in tents is a popular way of holidaying for those who are not unwilling to rough it a little.

Except in tropical or very inclement climates tents are not carried by European armies now in any large numbers. Troops are billeted in villages or bivouacked. A few tents for the senior officers, for offices, guards, and hospitals are provided in the equipment of British troops operating in Europe, and in peace manœuvres a sufficient number for all ranks. In India, too, this provision is always made. The European tents generally used are three in number: the *hospital marquee* (dimensions 29 feet long, 15 feet broad, and 15 feet high; sides, 5 feet high) has two poles; weighs in its valise with poles, four large and 180 small pins, and two mallets—492 lb. dry, about 600 lb. wet. It accommodates ten sick in beds or sixteen without. The circular *bell-tent* has a diameter at the base of 12½ feet, and is 10 feet high, taking fifteen men, and weighs about 83 lb. dry, about 100 lb. wet. The pole is in two pieces like those of the hospital marquee, and forty-two pins with two mallets go with each tent. Both these tents may be floored with wood or tarpaulin, and if the interior is dug out are much more commodious. They are made of sail canvas. The *tente abri*, or *shelter tent*, consists of two sheets, two poles, and seven pins; weighs 11 lb. dry, 16 lb. wet; and takes two or three men lying down. Each carries a part of the tent. They were used in the Nile expedition of 1884, but are now 'articles of store.' In India a large double-roofed square tent is always used, the upper roof projecting so as to form verandas. The sides are vertical and 5 feet high, kept rigid by short poles, and there is one large pole in the centre. Each accommodates sixteen soldiers or twelve sick. The Durbar tents of the Indian government are very large and beautifully made. Those used by the government officials are also much more commodious than ordinary tents.

Tentaculites, a genus of annulated tapering shells, found abundantly in Silurian and Devonian strata. Their affinities are somewhat obscure. By some writers they are regarded as tubicolar annelids, while others refer them with some hesitation to the pteropoda.

Tenterden, a municipal borough and market-town in the Weald of Kent, 12 miles SW. of Ashford and 9 S. by E. of Headcorn station. The church has a noble Perpendicular tower, built in the 15th century, and associated by legend with the Goodwin Sands (q.v.). The town, which enjoys the privileges of the Cinque Ports, obtained a charter from Henry VI. and another from Elizabeth. Pop. (1851) 3901; (1921) 3438.

Tenterden, CHARLES ABBOTT, BARON, was born a barber's son at Canterbury, 7th October 1762. A foundationer at King's School, Canterbury, he proceeded to Corpus Christi College, Oxford, where he graduated in 1785. Entered at the Middle Temple, he was called to the bar by the Inner Temple in 1796. He joined the Oxford circuit, and, in spite of a husky voice, a heavy face, and timid manners, his energy and knowledge soon brought a large practice. In 1801 he became recorder of Oxford, and next year published his clear and learned treatise on the *Law relative to Merchant Ships and Seamen*. It had the effect of increasing his employment in the more lucrative mercantile causes, so much that in 1807 he returned his income as upwards of £8000. In 1816 he accepted a puisne judgeship in the Court of Common Pleas; and in 1818 he was knighted, and chosen to succeed Lord Ellenborough as Chief-justice of the King's Bench. As a judge his most marked characteristic was his perspicacity and freedom from bias. He was raised to the peerage in 1827. In the House of Lords he strongly opposed the Catholic Relief Bill, and in his last speech he made a vow that if the Reform Bill, that 'appalling bill,' passed, he would never again take his seat as a peer. He died suddenly, 4th November 1832.

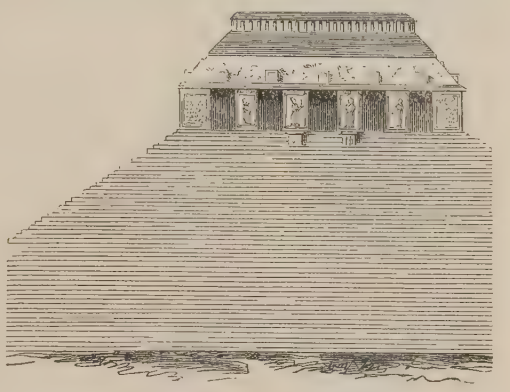
Tenure, a general name for the conditions on which land is held by the persons who occupy and use it. Forms of land tenure are of various kinds; the earliest of them are connected with the occupation of a tract of country by a tribe or village community; with the advance of civilisation individual rights were more precisely defined; under the Roman law land was a thing *in commercio*, to be used and disposed of at the discretion of the owner. The feudal system combined something of the precision of Roman law with the personal tie between lord and vassal as recognised in the customs of the barbarian nations. Rights in land were made the basis of social order; every man rendered definite services to the superior of whom he held. The Norman Conquest brought in a race of expert lawyers who would have carried feudal theory to an oppressive extreme if it had not been for the principles recognised in Magna Charta and afterwards embodied in legislation. All lands in England were, and still are, held of the crown; the actual owner or cultivator of the soil owed suit and service to the king or to some subject lord who held of the king. The Manor (q.v.) was the unit of administration. The tenures recognised by law were of three kinds: (1) Military tenures, such as knight-service, the chief incidents of which were the duty of serving in war, suit of court (attendance in the courts of the superior), aids, reliefs, and primer seizin (money payments on certain occasions), and escheat (reversion of the land to the lord on failure of heirs, &c.). The lord exacted a fine on alienation of the holding; he had the wardship of an infant heir, and as guardian disposed of his hand in marriage. These tenures were extremely burdensome, and the feudal rights of the crown were greatly abused. At the restoration of Charles II. the military tenures were abolished, except only the honorary services of Grand Serjeanty (q.v.). (2) Free socage—the service of freemen who rendered fealty and suit of court, together with some fixed service, such as might be, and always was, commuted for a payment in money. (3) Copyhold, the tenure of persons who originally were villeins or villagers holding at the will of the lord, but had gained a more secure position by the custom of the manor, and held copy of the court rolls on which their rights were recorded. Land assigned for the endowment of the church was held 'by divine service' or by the still easier tenure known as *frankalmoign* or free alms. In process of time feudal ideas of social order gave way to commercial ideas; land was regarded merely as a form of property to be used and disposed of at the discretion of its owners. The Law of Property Act, 1922, turned copyhold, customary freehold, and copyhold of ancient demesne into freehold, or, in some instances, into leasehold. The picturesque

and honorary services of grand and petty serjeanty were expressly retained. The result of recent legislative changes, culminating in the Law of Property Act, 1925, and other statutes passed in the same year dealing with real property was to leave only two forms of tenure, viz. (1) freehold, (2) leasehold. Copyhold, converted by the Act of 1922 into freehold, was automatically freed from the customary suits and services and from liability to do fealty, and provision was made for the extinguishment, at latest at end of 1935, of other manorial incidents. Freehold existing at the end of 1925 was not affected, except that, at the end of 1935 at latest, any liability to payment or relief will be extinguished. Fealty and suit of court, which are still theoretically due from a freeholder, are apparently not extinguished in the case of freehold existing before 1926. These two and the services and grand and petty serjeanty will at the end of 1935 be the only remaining incidents of freehold tenure. The distribution and management of land are governed by contract, not by feudal rule. Economists and lawyers hold for the most part that 'free trade in land' is justified by its results; Sir H. Maine points to the rapid settlement of North America as a sample of what can be done by men stimulated by the hope of acquiring property. Socialists and land-nationalisers hold that property in land is the cause of an unjust distribution of wealth; they would take all land (with or without compensation to existing owners) into the hands of the community, and they would permit no tenure except on such terms as the community might consider to be advantageous.

In Scotland, as in England, the feudal system was long established. Subinfeudation (grant of land by a free vassal to another person to hold under himself) has been forbidden in England since 1290, because it was found to prejudice the rights of superior lords; but the practice was permitted in Scotland. Modern Scots law distinguishes between the property or *dominium utile* of land and the superiority or *dominium directum*, the chief incident of which is the feu-duty paid by the vassal. On alienation of the land or death of the vassal forms were used implying consent or recognition by the superior, and casualties or additional payments were made on such occasions. These forms and the endless creation of subordinate feudal rights tended to complicate the whole system of conveyancing; but the law has been greatly simplified by recent statutes (see CONVEYANCING). In Ireland the English law displaced and abolished the customs of the Celtic tribes; but the country never was thoroughly feudalised, and the peasant farmers have always been hostile to English notions of free trade in land (see LAND LAWS). In the United States (except Louisiana) and in those British colonies which have been formed in countries previously unsettled the English law of tenure forms the historical basis of the local law; but in a new country there are of course neither lords nor vassals, and the phrases of the feudal law only serve to remind us that land is and always must be held under some governing authority, and on such terms as legislators may impose upon the owners and cultivators.

For the early history of tenure, see Coulanges, *Origin of Property in Land* (trans. by Ashley); Elton, *Origins of English History*; Skene, *Celtic Scotland*; and Richey, *Irish Land Laws*. For curious tenures on quaint and merely nominal conditions, such as bearing a silver jug and basin as often as the king might visit the lands granted, see Thomas Blount, *Ancient and Jocular Tenures* (1679; new ed. 1815). For a comparison of modern forms of tenure, Cliffe Leslie, *Land Systems*, and the Cobden Club Essays may be mentioned. See also the articles BLANCH, CHARTER, COPYHOLD, FEU, FEUDALISM, FREEHOLD, &c.

Teocalli (Mexican, lit. 'house of a god'), the name given to the temples of the aborigines of Mexico, of which many still remain in a more or less perfect state. They were built in the form of four-sided pyramids, and consisted for the most part of two, three, or more stories or terraces, with the temple, properly so called, placed on a platform on the summit. In some cases they were natural hills, faced with layers of stone, adobe, plaster, &c. The largest and most celebrated is the pyramid of Cholula, measuring 1440



Teocalli at Palenque.

feet each way, and 177 in height; it is much defaced, and the temple on its summit has been removed. The teocallis in Yucatán are in far better preservation; they are not generally built in terraces, but rise at an angle of 45° to the level of the platform, with an unbroken series of steps from base to summit. The temples on their summit are sometimes ornamented with bas-reliefs and hieroglyphic tablets. See MEXICO.

Tepic, a town of Mexico, capital of Nayarit territory, in a fertile upland valley, 30 miles E. by S. of San Blas. Its 14,000 inhabitants are largely employed in the numerous neighbouring mines.

Teplitz (Czech. *Teplice*), a watering-place in the north-west of Bohemia, in a beautiful valley near the Erzgebirge, 20 miles NW. of Leitmeritz by rail. The baths are supplied from about a dozen hot alkalo-saline springs, are taken exceedingly hot, and are good for gout, rheumatism, &c. One of the springs is used also for drinking. Schönau (*Sanov*), a neighbouring village, was incorporated with Teplitz in 1895. Pop. of Teplitz-Schönau, 29,000.

Terai, or TARAI. See HIMALAYA.

Ter'amo (anc. *Interamna Praetuttiorum*), a town of Italy, the capital of a province, on the Tordino, 84 miles S. of Ancona by a branch-line, 16 miles long, from Giulianova on the coast railway. Its Gothic cathedral (1355) has been partly modernised; some Roman antiquities have been discovered. Pop. (1901) 24,091; (1921) 25,830.

Teraphim, a Hebrew word of uncertain derivation, denoting a certain kind of images, idols, or household gods, of a human figure, associated with divination, and commonly used in the popular worship. The *gods* which Rachel stole are called teraphim, and Saul's daughter Michal placed a teraph in David's bed to conceal his flight. This veneration for teraphim flourished side by side with the worship of Jahweh, though condemned by the prophets.

Teratology, the study of malformations or abnormal growths, animal or vegetable. Those of the animal kingdom are treated at MONSTROSITY, DEFORMITIES, CLUB-FOOT, DWARF, HARELIP, &c.

For those of the vegetable world, see PLANTS (*Diseases*), and such articles as ANBURY, BEDEGUAR, GALLS. Under this head come abnormal forms like four-leaved clover, &c., as well as changes in the form of plants brought about by the skill of gardeners and agriculturists—such as the bulbous modification of the roots of turnips, the development of such a growth as cauliflower, the production of double-flowering plants, and the metamorphosis of organs.

Terbium (Tb; atom. number 65; atom. wt. 159·2), a rare metallic element found in gadolinite and other minerals. It takes its name from Ytterby (see YTTRIUM, ERBIUM).

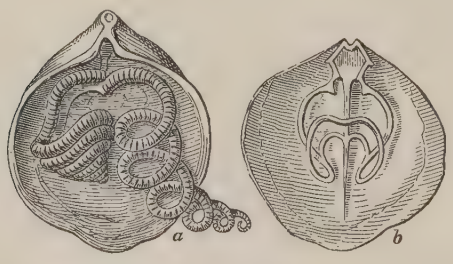
Terburg, or TERBORCH, GERARD, born at Zwolle in 1608, studied first under his father, Gerard (1584–1662), and afterwards visited Italy and England, was at Münster during the congress of 1648, and later at Madrid. On his return he settled at Deventer, where he became burgomaster, and died 8th December 1681. The elegant life of his time, with its superfine manners and splendid costume, found in Terburg an admirable painter. The central figure in many of his pictures is a fair-haired young lady in white satin; delicacy, grace, and humour, and marvellous mastery of technique in draperies inform all his work. His most famous picture is a small work on copper containing portraits of the sixty-nine plenipotentiaries who drew up the Treaty of Westphalia. See Hellens, *Terborch* (1911), Smith and de Groot, *Catalogue Raisonné of Dutch Painters* (v. 1913).

Terce. See BREVIARY; and for terce, the widow's portion, see HUSBAND AND WIFE.

Terceira. See AZORES.

Terebinth (Gr. *terebinthos*), another name for the Turpentine-tree, described at PISTACIA, the genus to which it belongs, and for the turpentine obtained from it. Terebinthaceæ is a term that has sometimes been used either for a part or for the whole of the Anacardiaceæ, to which belong the turpentine-tree, pistachio-nut, mango, sumach, Japan lacquer (Rhus), &c.

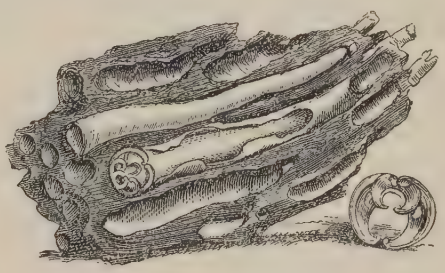
Terebratula, a genus of Brachiopods (q.v.) or lamp-shells, represented from Devonian Ages to the present day. Extant forms live fixed to stones or rock on the sea-floor at various depths; thus *T. vitrea* occurs from 5 to 1456 fathoms. The animal is of complicated structure, and is enclosed in a finely punctate shell with two hinged valves (dorsal and ventral, not lateral as in bivalve molluscs). The ventral valve has a beak through



Terebratula:
a, valve with the spiral arms; *b*, valve with arms removed.

a hole in which an attaching muscular stalk projects. In the cavity within the shell there are two long coiled processes of the body-wall, called 'arms,' which bear ciliated (food-wafting and respiratory) tentacles, and are supported by a calcareous loop. There are two British species.

Teredo, or SHIPWORM, a genus of bivalve molluscs, related to Pholads, peculiarly adapted as wood-borers. The body of the animal is elongated into a worm-like shape; the two respiratory siphons are also long and protrusible from the open end of the tunnel. As to the limy parts, they include (1) two relatively very small, deeply-notched anterior valves, the rasping instruments in the boring; (2) a long thin 'tube' lining the tunnel; and (3) two small 'pallets' at the base of the siphons, which close the mouth of the tunnel when the siphons are retracted. The length of 'tube'



Common Shipworm (*Teredo navalis*).

varies from a few inches to a couple of feet. The 'foot' is short and truncate; its movements probably help the shell-valves in boring. Shipworms feed on the triturated wood, but also on microscopic organisms. They do much damage to ships' timber and the woodwork of harbours; they caused the famous dam-break in Holland at the beginning of the 18th century. The burrows usually follow the grain, and one does not encroach on another. Some very hard woods resist them; metal sheaths, an armature of nails driven in, and thick coatings of tarry material may be used as preventives. Shipworms were well known to the ancients. See references in Theophrastus, Pliny, and Ovid.

Terek, a stream of the Caucasus, rising near lofty Mount Kasbek, and flowing 350 miles, generally north-east, until, at Kisliar, it divides into several branches, which form a delta 70 miles broad, and finally falls into the Caspian Sea.

Terence. Publius Terentius Afer, Roman comic poet, was born at Carthage about 185 B.C., in the interval between the second and third Punic wars. He was presumably a Phœnician by race; and he became, by birth or purchase, the slave of the Roman senator P. Terentius Lucanus, who brought him to Rome, and, out of regard to his handsome person and unusual talents, educated him highly, and finally manumitted him. On his manumission he assumed, of course, his patron's *nomen*, Terentius. His first play was the *Andria*, acted in 166 B.C. Its success was immediate, and introduced its author to the most refined society of Rome, where his engaging address and accomplishments made him a great favourite. His chief patrons were Lælius and the younger Scipio, after living with whom in great intimacy for some years in Rome he went to Greece, doubtless with the view of becoming personally familiar with Greek life and manners; and there he seems to have died in 159 B.C., only about twenty-five years old. Six comedies are extant under the name of Terence, which are perhaps all he produced—viz. *Andria*, exhibited in 166 at the Megalensian games, an adaptation of Menander's *Andria* with additions from the same poet's *Perinthia;* the bright and lively *Eunuchus*, from Menander's *Eunouchos* and some parts of his *Kolax; Heauton Timoroumenos* ('the self-tormentor'), after Men-

ander's play of the same title, without the use of another play, a comedy of intrigue, with a somewhat extravagant plot, and but little attempt at delineation of character; *Phormio*, so called from the parasite in the play, the original by Apollodoros of Karystos being entitled *Epidikazomenos*, a bright merry comedy, with an interesting plot and careful character-painting; *Hecyra*, the mother-in-law, his least successful piece, the plot poor and uninteresting, the characters peculiar; and *Adelphi*, from Menander's *Adelphoi*, with the addition of a scene from the beginning of Diphilos' *Synapothnēskontes*, an effective comedy, with simple and harmonious plot, and careful delineation of character—the two old men, the easy bachelor about town and the embarrassed country landlord, forming an inimitable contrast. Thus, as we have seen, Terence has no claim to creative originality, his plays, Greek in origin and Greek in scene, being directly based on Menander, who, indeed, is best known to us through the works of his copyist. Cæsar, in a well-known epigram, addresses him 'O dimidiate Menander.' A foreigner in Rome and a total stranger to Greece when he wrote, he gave the still somewhat uncouth Romans a picture of the grace, elegance, and refinement of Greek manners; and he wrote in singularly pure and perfect Latin—ranked by Munro in the very highest level with Cicero, Cæsar, and Lucretius. His style, indeed, is pure almost to being immaculate, and, though inferior to Plautus in comic power, in mastery over passion, in vigour and variety, he is more than his match in consistency of plot and character, in tenderness, in wit, in effective dialogue, and in metrical skill. He employs almost exclusively iambic and trochaic metres. He admitted and defended from the example of the older Roman poets the practice of *contaminatio*—constructing one Latin play by uniting scenes from several separate Greek ones. He was a true artist. In conjunction with Plautus, Terence, on the revival of letters, was studied as a model by the most accomplished play-writers. The *Eunuchus* is reflected in the *Bellamira* of Sir Charles Sedley and *Le Muet* of Brueys; the *Adelphi* in Molière's *École des Maris* and Baron's *L'École des Pères;* and the *Phormio* in Molière's *Les Fourberies de Scapin.*

His plays have been translated into most of the European languages, as by G. Colman (1765 *et seq.*) and Ritchie (1927) into English. Notable editions of his works are those of Bentley (1726), Davies, Parry, Fleckeisen (1857), Wagner (1869), Umpfenbach (1870), Dziatzko (1884), R. Y. Tyrrell (1903), and Sargeaunt (text and trans., 1912 *et seq.*). See also G. Norwood, *The Art of Terence* (1923).

Teresa, or THERESA, ST, one of the most remarkable of the women saints of the modern Roman calendar, was born at Ávila, in Old Castile, March 28, 1515, of the noble house of Cepeda Even as a child she was remarkable for piety of a most enthusiastic kind; and, educated in a convent in her native city, she entered a convent of the Carmelite order there in 1534. In this convent she continued to reside for nearly thirty years, but it was not till about the year 1539 that her constitution became strong enough to permit her to follow, even in an imperfect way, the observances of conventual life. Her own account of her mental and spiritual condition is interesting from the first; but it was not till 1555 that a change of heart and of purpose came, which was as complete and decisive as her former condition had been purposeless or fluctuating. After a time her religious exercises reached a most extraordinary degree of asceticism. Her prayers were almost continual, and she was reported to be favoured with visions, ecstasies, and other supernatural visitations. The fame of her sanctity spread not only throughout Spain, but into almost every part of the church. By some the reality of the reported supernatural favours which were ascribed to her was called in question; and there were even some who threatened to invoke the rigorous investigation of the Holy Office; but the popular voice was freely accorded to her, and the authority of St Francis Borgia, St Peter of Alcántara, and other influential churchmen eventually disarmed the opposition. The most notable and permanent fruit of the enthusiastic spirituality of Teresa is the reform of the Carmelite order, of which she became the instrument. She commenced this work in concert with a few zealous members of her own sisterhood in the convent at Ávila, where she had resided from the date of her profession; but after a time she obtained permission from the holy see to remove with her little community to a humble house in the same city, where she re-established in its full rigour the ancient Carmelite rule, as approved by Innocent IV. in 1247, with some additional observances introduced by herself. This new convent of St Joseph's was established in 1562, in which year she assumed the name of Teresa de Jesús; and in 1565 she obtained from the pope, Pius IV., a formal approval for the rule as modified by her. For two years Teresa lived in great privacy and quiet in her convent; but in 1567 the general of the Carmelite order, F. Rubeo, was so struck, during his visitation of the convents at Ávila, with the condition of that over which Teresa presided that he urged upon her the duty of extending throughout the order the reforms thus successfully initiated. Teresa entered upon the work with great energy, and although she met with much opposition, nevertheless succeeded in carrying out her reforms. In 1579 the Carmelites of the stricter observance established by Teresa were released from the jurisdiction of the old superiors, and united into a distinct association, with a separate head and a distinct organisation, which was approved in 1580 by Pope Gregory XIII. Under this new constitution the association flourished and extended; and within her own lifetime no fewer than seventeen convents of women and sixteen of men accepted the reforms which she had originated. Teresa died at Alba, October 4, 1582, in her sixty-eighth year. She was canonised by Gregory XV. in 1622, her feast being fixed on the 15th October.

She left a number of works, which have at all times maintained a high reputation among a large section of her own church; their merits are also acknowledged by non-Catholic writers. They consist of ascetical and mystical treatises, instructions in the conventual life, meditations, besides a large number of letters which possess remarkable literary merit. The best-known treatises are her autobiography, *The Way of Perfection*, *The Book of the Foundations* (trans. by Dalton, 1853), and *The Interior Castle* (trans. by Dalton, 1852). Her works in the original Spanish fill two folio volumes (Salamanca, 1587), and they have been in whole or in part translated into almost every European language. Migne issued a French edition in 4 vols. (1840–46). Another complete French edition (6 vols.) by the Carmelites of the First Monastery of Paris was published in 1907–10. An English translation of her *Letters* (4 vols.) by the Benedictines of Stanbrook began to appear in 1920. Her life occupies nearly an entire volume of the *Acta Sanctorum;* and several biographies have been written in Spanish (Ribera's appeared in 1690), French, Italian, German, English—as that by Canon Dalton (1851), that edited by Cardinal Manning (1865), Miss Trench's (1875), Father Coleridge's (3 vols. 1881–88), Mrs Cunninghame Graham's (1894), and that by a French Carmelite nun, translated by Alice Lady Lovat in 1912.

Terlizzi, a town of Italy, 18 miles W. of Bari. It has a very strongly fortified castle, to which the Emperor Frederick II. sometimes resorted. Pop. (1921) 23,639.

Term, a day fixed by law and usage for payment of rent, and for the commencement and

termination of the contract between landlord and tenant; also the period between two terms. In England and Ireland the year is divided into four quarters or terms. These are Lady Day, March 25; Midsummer Day, June 24; Michaelmas Day, September 29; and Christmas Day, December 25. In Scotland the terms as between landlord and tenant are divided into legal and conventional terms. There are two terms recognised by common law—viz. Whitsunday, May 15, and Martinmas, November 11; while other two conventional terms subdivide these—viz. Candlemas, February 2, and Lammas, August 1. Removal terms and the terms by which domestic servants are engaged are the 28th May and 28th November. The Michaelmas term is the most important in England, whereas in Scotland it is Whitsunday. There is also a subdivision of the year into Law-terms; since the passing of the Judicature Acts the traditional terms are superseded by the times fixed for sittings of the courts by statute, but for some purposes we still distinguish Hilary, Easter, Trinity, and Michaelmas terms. At the English universities there are nominally four terms in the year, but usage has established three working terms of about nine weeks each.

Termini Imerese, a seaport on the north coast of Sicily, 23 miles ESE. of Palermo by rail. Pop. (1921) 18,640. The industries are tunny and sardine fishing. The ancient city of *Thermæ Himerenses* was founded here by the Carthaginians in 407 B.C., after the destruction of the Greek city of Himera. The springs are praised by Pindar. Agathocles was a native of this city, and captured it in 307. Under the Roman rule it flourished through its baths. Of these some fragments still exist (though hidden by the construction of the modern bath establishment, which is still fairly well frequented), as well as of an amphitheatre and two aqueducts. These last are especially noteworthy; at one point a deep valley is crossed by an inverted siphon. The city museum is interesting, and has remains of Quaternary mammals.

Terminus, a Roman divinity, supposed to preside over public and private boundaries. Originally he appears to have been the same as Jupiter himself, but gradually he was recognised as a separate and distinct god.

Termites, or WHITE ANTS, a remarkable order or sub-order, Isoptera, of somewhat primitive insects, distantly related to cockroaches and the like, with highly developed social organisation,

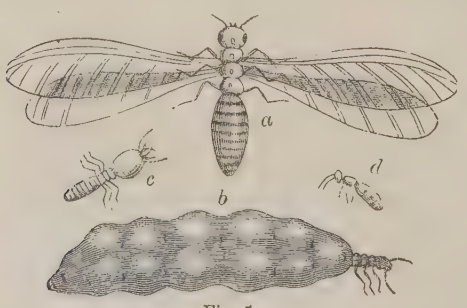


Fig. 1.
a, perfect male termite; *b*, female distended with eggs; *c*, soldier; *d*, worker.

though not always to the same degree. They are widely distributed in tropical and sub-tropical countries, and over a thousand species are known. They are in no way related to true ants, which belong to the highly evolved order Hymenoptera, and they are much more archaic. For although no fossil termites are known before the Eocene, they probably diverged from an Orthopteran or primitive cockroach stock in late Palæozoic or early Mesozoic times. Termites feed almost exclusively on dead vegetable substances, and all the wood-eaters that have been studied have been found to contain numerous symbiotic Infusorians in their food-canal, which prepare the dryasdust food. By slightly raising the temperature it is easy to kill the partner Infusorians without injuring the termites, and in this way it has been proved that the Symbiosis (q.v.) is indispensable. In the cases that have been studied, the termites cannot utilise the masticated wood unless the Infusorians first work on it. Although termites are in many places very common and their ant-hills or termitaries very conspicuous, the insects themselves are not nearly so familiar as true ants, for they have usually a great dislike to the light of day, and hide their pale thin-skinned wingless bodies in covered galleries and tunnels. The dark-skinned sexual forms are winged, but do not fly about for more than a very short time.

Among the structural characters of termites the following may be noted: the strong jaws suited for chewing; the weak cuticle; the elongate abdomen with ten or eleven segments and two terminal spines or cerci; the long delicate wings with few veins, restricted to the sexual forms, and showing a basal suture across which they readily break off; the predominance of sterile wingless individuals; the simple nature of the antennæ; the frequent absence of eyes. The young termites that hatch out of the eggs are not very different from the adults except in size. In other words, there is little or no metamorphosis. The termite's brain is relatively small. Sounds are mechanically produced by working one part of the body against another, and these sounds probably serve as a means of communication. But both these points are obscure. So also is the secretion of a strong corrosive fluid.

Among the higher termites, such as the African *Termes bellicosus*, there may be hundreds of thousands of individuals in a colony, sometimes probably millions. But in a primitive species there may be only a few dozen or fewer. In the great majority there are five castes, three fertile and two normally sterile. First, there are the 'kings' and 'queens,' the ordinary males and females, deeply pigmented, with relatively large brain and eyes. After the antenuptial flight they discard their wings, and the female settles down to extraordinary maternity. Second, there are complemental or substitutional kings and queens, less pigmented, with small brain and eyes, with vestigial wings. Third, there are peculiar, not very intelligible, adults, sometimes called 'ergatoid,' scarcely pigmented, entirely wingless, small-brained. Fourth, there are the wingless, unpigmented, non-reproductive workers, arrested individuals of both sexes, small-brained and often blind. Fifth, there are the wingless, big-headed, very small-brained, usually more or less blind soldiers, also arrested individuals of both sexes. Soldiers and workers are in some respects persistently larval; the complemental and ergatoid reproductive forms are also arrested. The fully-winged 'kings' and 'queens' are the only individuals that attain complete development. As there are often two sizes of workers and three sizes of soldiers, there are sixteen different kinds of individuals, though no single colony may show them all. It used to be thought that the differences between the castes were due to differences in nurture, but further investigation points to the conclusion that the differences are largely germinal, that is

determined in the egg. Thus, in the youngest stage there seems to be a distinct difference between the reproductive and the sterile. Here it should be noted that the workers and soldiers are occasionally fertile, apparently producing others like themselves. The kings and queens can reproduce all the castes; the complementals give rise to complementals, ergatoids, workers, and soldiers; the ergatoids can give rise to ergatoids, workers, and soldiers, just as if somewhat was lost at each stage. In this connection the chromosomes deserve close study as well as the metabolism.

The dark-coloured kings and queens leave the nest in an aerial swarm, but the association in couples occurs on the ground after a short flight and after the discarding of wings. A hole is dug by the young king and queen, and this is the beginning of the termitarium. Only after some construction is completed does actual pairing occur, and the whole colony is the progeny of the two.

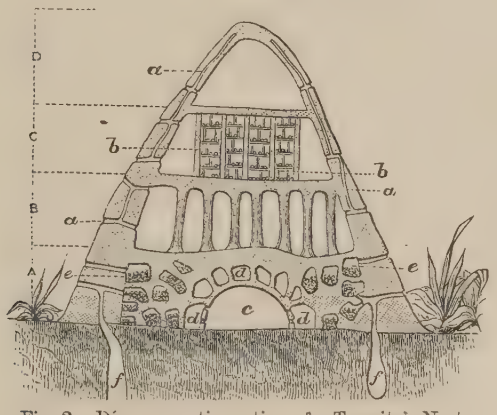


Fig. 2.—Diagrammatic section of a Termite's Nest (after Houssay):

In the walls there are winding passages, *a*; uppermost is a well-aired empty attic, D; the next story, C, is a nursery where the young termites are hatched on shelves, *b*; the next is a hall, B, supported by pillars; beneath this is a royal chamber, *c*, in which the king and queen are imprisoned; around this are the chambers of worker-termites, *d*, and some store-chambers, *e*; excavated in the ground are holes, *f*, out of which the material used in making the termitary was dug.

In the higher termites the queen's abdomen eventually becomes extraordinarily swollen, even four inches long, 20,000 times the volume of a worker's. According to Escherich, she may for a long period lay an egg every few seconds, about 30,000 a day; 10 million may be laid in a year, and 100 million during her lifetime of about ten years. The complementals or the ergatoids may take the places of the king and queen if these should die. The workers have to do with foraging, feeding, nursing, building, and repairing. The soldiers are defensive, but some with vestigial jaws, known as nasuti, squirt drops of sticky fluid on their assailants. The domestic economy includes feeding one another with saliva, regurgitated food, and fæcal matter. Moreover all the castes form exudates which the others lick off. This is most copious on the swollen queen, who is therefore much licked, and not always gently, by the workers.

Termites like darkness, moisture, and stagnant air, only a few exceptional forms foraging in the open sunlight; and these conditions are fulfilled by the nests or termitaria, which also afford protection against enemies. The nest may be a system of excavated tunnels in the soil or in dead wood, but it is often an elaborate construction of chewed earth or wood or both, built on the ground or sometimes up a tree. Some great ground edifices attain a height of 20 feet, and they may be strong enough to bear a man's weight. The salivated clay is sometimes hard like cement. A common feature of the termitary is the central royal chamber for the prolific queen. Also noteworthy is the absence of doorways, for these lucifugous insects reach their feeding grounds by tunnels in the earth or along covered arcades made of earth or wood. In many cases there are store-chambers in the termitary, full of cut grass or plant fragments of some sort. Tree-nests are usually somewhat spherical, varying from the size of a football to that of a barrel, and they are mostly made of masticated wood. Some strange African and Indian tree-nests are like big brown stalactites hanging from the branches. The famous compass or meridional termitaria of northern Australia, often 10 feet in height, have their two long surfaces facing east and west, and their narrow gable ends facing north and south, thus reducing exposure to the heat of the sun. Many ground-nests are like big mole-hills, but strong enough to stand on; in equatorial Africa there are neatly built mushroom-like forms, from a few inches to a foot in height.

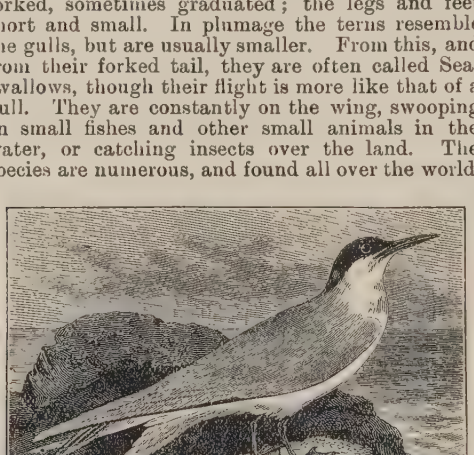
Termites are represented by various genera, of which Termes is the most important. Others are Eutermes, Calotermes, Anoplotermes, Hodotermes, Reticulitermes. They are grouped in four families, Mastotermitidæ, Protermitidæ, Mesotermitidæ, and Metatermitidæ, which are arranged in order of their evolution from the generalised (Mastotermes) to the highly specialised (Termes). A few species of Termes have been introduced into Europe, e.g. *Termes lucifugus* in dockyards.

The inter-relations of termites with other organisms are many. No mixed colonies are known, but there are compound nests whose galleries are tenanted by two or more species. True ants often live in termitaries. Various insects, the 'termitophiles,' habitually live in association with termites, just as with true ants; and in both cases the associates may be grouped as injurious intruders, parasites, tolerated guests, and true guests. The last exude secretions which are greedily devoured by the termites; in exchange they sometimes receive regurgitated food. But they may also help themselves to young termites. Most of the termitophiles are beetles, but there are representatives of some other orders, such as Diptera. Very remarkable is the development of pathological 'physogastry' among some of the guests, a curious state with abdominal enlargement, accumulation of fat, blindness and winglessness, which Wheeler attributes to confinement within narrow galleries and chambers, the very limited supply of oxygen, the absence of light, and an abundance of carbohydrate food. Some termites, like true ants, form fungus gardens in their galleries. The symbiotic Infusorians in the food-canal have been already alluded to. The termite mounds often shelter other animals, such as scorpions, snakes, lizards, and even birds. The Aard-Vark burglars them at night; and termites afford food for many other insect-eaters. Termites prune off decayed branches from trees; they devour decaying vegetation; they keep the soil circulating, for instance in making tunnels of salivated earth up the stems and along the branches, for those that are not too hard are eventually weathered off and the fine particles may be carried by torrential rains into streams, and go to increase the alluvium of the distant valley. In short, termites have, like earthworms, a soil-making function. The circle of their life often intersects man's, as when they destroy floors, rafters, furniture, boxes, books, and papers. The Australian bushmen make temporary ovens of the termite mounds, and may even eat some of the salivated clay; the hillmen of India

eat the termites themselves; the pulverised earth is often used as a basis for tennis-courts and the like.

See W. M. Wheeler, *Social Life among the Insects* (1923); Escherich, *Die Termiten* (1909), *Termitenleben* (1911); Hegh, *Les Termites* (1922); Maeterlinck, *Les Termites* (1927).

Tern, the name applied to several genera of birds of the Gull family (Laridæ), by some made into a sub-family (Sterninæ); they have the bill as long as or longer than the head, nearly straight, compressed, slender, tapering; the wings long and pointed; the tail usually long and more or less forked, sometimes graduated; the legs and feet short and small. In plumage the terns resemble the gulls, but are usually smaller. From this, and from their forked tail, they are often called Sea-swallows, though their flight is more like that of a gull. They are constantly on the wing, swooping on small fishes and other small animals in the water, or catching insects over the land. The species are numerous, and found all over the world.



Common Tern (*Sterna fluviatilis*).

The *Scotia* explorers found the Arctic Tern (*S. macrura*) as a summer visitor within the Antarctic circle. The Common Tern (*S. fluviatilis*), abundant on the more southern coasts of Britain, is also found on the coasts of Europe, western Asia, western Africa as far as Accra, and eastern North America. Terns make little or no nest, laying their spotted eggs on sand or shingle, from which they are often with difficulty distinguished. Some, however, breed in marshes, and some occasionally build on trees and bushes, as is the case with the Noddy (*Anous stolidus*). This bird derives its name from the ease with which it is caught when it alights on ships to rest; it has a graduated tail, and is sooty-brown, with a gray cap. It is found in all tropical waters, and has even occurred on the Irish coast. The Sooty Tern (*S. fuliginosa*) breeds in vast numbers on Ascension Island, where it is known as the 'Wideawake.' Careful experiments by Prof. J. B. Watson and Dr K. M. Lashley have shown that marked Sooty and Noddy terns removed from their nests on the Tortugas and taken in closed baskets on board ship into waters not within their migratory range will 'home' in a variable percentage of cases, even from a distance of 850 miles (Cape Hatteras).

Ternate. See MOLUCCAS.

Terneuzen, a small Dutch port in Zeeland, on the south bank of the Scheldt.

Terni, an episcopal see of Central Italy, situated on the Nera, 70 miles NNE. of Rome by rail. Pop. 20,230 (town); 36,320 (commune). It was the ancient *Interamna Nahars,* and its site was inhabited in the early Iron Age, as the discovery of numerous Villanovan tombs and huts shows. In Roman times it was a city of some note. The historian Tacitus was perhaps born here (the Emperor Tacitus certainly was), and remains of the city walls, of an amphitheatre, and of other buildings may still be seen. There was continual litigation with Reate (mod. Rieti) as to the regulation of the river Velinus (mod. Velino), which deposited so much carbonate of lime as to block up its own channel; and similar difficulties occurred in the 15th–18th centuries. Remains of the mediæval walls, and of a few Romanesque churches are still to be seen. But the town is now important for its iron and steel works, the largest in Italy, at which armour-plating, artillery, machinery, rails, &c., are made. Wool, jute, carbide of calcium, &c., are also manufactured. Three miles to the E. are the famous falls of the Velino, which falls in three leaps from a total height of 525 feet. They were celebrated by Byron in his *Childe Harold;* but their beauty has been much diminished by the use of the water for numerous electric power-plants.

Ternstrœmiaceæ, or THEACEÆ, a family of dicotyledons, consists of trees and shrubs. They are most abundant in America and tropical Asia; some are found in Madagascar and other African islands (one, *Ternstrœmia africana,* on the mainland in Angola), and some in Pacific islands. The leaves are alternate, leathery, in many species evergreen, generally undivided, sometimes dotted. Those species which have penetrated the temperate zones have adapted themselves to conditions and become deciduous. This family is very important as containing the Tea-shrubs. It is also interesting because of the great beauty both of the foliage and flowers of many of the species, of which the genus Camellia affords the best-known examples. See TEA, CAMELLIA, and GORDONIA. The genus Ternstrœmia was named in 1781 from the Swedish naturalist Ternström.

Terpander, regarded as the father of Greek music and lyric poetry, a Lesbian from Antissa, is supposed to have settled in Sparta about the time of the first Messenian war.

Terpsichoré (Gr., 'delighting in the dance'), one of the nine Muses (q.v.), presided over choral song and dancing.

Terraces, in Geology, comparatively level strips of land near the sea, lakes, or rivers, with a sharp descent at the edge towards the water, showing an ancient water-level. See BEACHES (RAISED), GLENROY, RIVER, LAKE, VALLEY.

Terracina, a coast town of Central Italy, 68 miles by rail SE. of Rome; pop. 13,000. The Roman Tarracina occupied the site of the Volscian Anxur, and the mediæval town, surrounded by walls with towers of the late Roman period, is largely built upon or among Roman remains. Thus, the pavement of the Roman forum (which in part rests on arched substructions) is still preserved in the piazza in front of the cathedral, itself built into the chief temple of the ancient city. The back of the temple is still preserved; while the cathedral, with its Cosmatesque portico, campanile, pavement, pulpit, and Easter candlestick, is of great interest. There are also massive polygonal substruction walls of the Volscian and Roman periods. In imperial days the city (the local museum gives an idea of its importance) extended over the low ground towards the sea: here were the harbour (now in part filled up), the amphitheatre, the thermæ, &c.: and here Pius VI., who restored the Via Appia, built the Borgo (suburb), the modern part of the town. Here there is a small harbour at the mouth of the navigable drainage canal of the Pomptine Marshes: and here we may notice the base of the Pesco Montano, an isolated dolomitic rock some 300 feet high, which was cut for 120 feet vertically, probably by Trajan,

in order to allow the Via Appia to pass round its base. The road originally ascended through the town and over the top of the promontory of Monte S. Angelo (747 feet), where considerable remains of its course, and of the buildings along it, may still be seen. On the summit of the promontory was the citadel of the republican period, and within this, immediately above the Pesco Montano, the platform of the temple of Jupiter Anxur, supported by colossal arcades of concrete. From here there is a magnificent view of the coast towards Gaeta, of the lake of Fondi, of the Circeian promontory, and of the Pomptine Marshes, at the edge of which Terracina lies, though not itself affected by the malaria.

See *Forma Italiae* (fasc. i., by Lugli, 1926).

Terra-cotta, an Italian term for hard unglazed pottery ('baked clay'), used (first to any extent by the Greeks) for making decorative bricks and tiles, architectural embellishments, statuary, vases, &c. After the clay was modelled, or moulded, it was usually coloured. Much excellent ware has been found at Tanagra (q.v.), while the Etruscans produced some splendid terra-cotta sarcophagi (see ETRURIA, *Civilisation*). The Romans rivalled but hardly equalled the Greeks in producing masterpieces of sculpture in this material, and the industry spread to the provinces but came to an end with the fall of the Roman Empire. It was revived at the Renaissance for use with Gothic architecture, while Donatello and other Florentine sculptors produced some beautiful work in terra-cotta. Luca della Robbia (see ROBBIA) introduced many improvements in the process of manufacture. After the 16th century the industry again died down, and was only revived in the last half of the 19th century (see DOULTON, TINWORTH), when terra-cotta came to be employed both for the purposes of sculpture and also for the fronts and other portions of important buildings, such as the Natural History Museum and the Albert Hall in South Kensington. Terra-cotta is peculiarly well suited for architectural work in towns like the metropolis, where stone too readily decays, or in cities like Berlin, to which stone has to be brought from a long distance. Important collections of ancient and mediæval terra-cotta work are to be found in the British Museum, the Victoria and Albert Museum, the Louvre, and the museums of Berlin and Athens.

See POTTERY; the relevant catalogues and publications of the principal museums; Hutton, *Greek Terra-cotta Statuettes* (1899); Walters, *Ancient Pottery* (1905); Lecuyer, *Antiques terres cuites* (1905).

Terra di Lavoro, the old name for the province of Caserta. (q.v.).

Terra firma, a term frequently employed to denote continental land as distinguished from islands. But it was at one time more specially applied to all the mainland of Italy which acknowledged the supremacy of Venice, and to the northern part of South America. Colloquially, the phrase *terra firma* is applied (but erroneously) to dry land as distinguished from water.

Terra Japonica. See CATECHU.

Terramara is an Italian name, adopted by archæologists, for a mixture of clay, sand, ashes, &c., found in the form of artificial mounds. Terremare are most abundant in the basin of the Po, but they occur in other parts of Italy, even the extreme south. The mounds are analogous to the kitchen-middens of northern Europe, and they have been formed under pile-dwellings. The dwellings themselves seem to have been quadrangular log-huts. There is reason to believe that when rubbish filled up the space between the piles the settlement was burned and rebuilt at a higher level. The mound is surrounded by a moat. Objects found in the terremare indicate the end of the Stone Age and the earlier part of the Bronze Age. They include coarse and fine pottery, needles, pins, combs and other articles of bone, horn, and wood, clay figures of animals, a few axes, spear-heads, chisels and other weapons and implements of stone, and numerous objects of copper and bronze, such as knives, razors, axes, sickles, weapons, pins, and brooches. Who the inhabitants were is disputed (see ITALY, *Ethnology*). They cultivated wheat, beans, flax, and the vine. They kept domestic animals. They hunted. The form of their settlements, if not intended as a protection against floods, may be a survival from a time when they built in lakes. On the other hand protection against enemies may have been the object. Some at least of the dead seem to have been cremated. See Ridgeway, *Early Age of Greece* (1901–10), *Who were the Romans?* (1908); Montelius, *La Civilisation primitive en Italie* (1895); Peet, *Stone and Bronze Ages in Italy* (1909); Munro, *Palæolithic Man and Terramara Settlements in Europe* (1912).

Terranova di Sicilia, a seaport (there is no proper harbour, but only an open roadstead) on the south coast of Sicily, 60 miles W. of Syracuse; pop. 26,000. It occupies the site of the ancient Gela (q.v.). Its greatest prosperity was under Hippocrates, who defeated the Syracusans in 492 B.C. It was in the same century that its inhabitants erected a treasury at Olympia (q.v.), decorated with painted terra-cottas. It was sacked by the Carthaginians in 405 B.C., and repopulated in 338 B.C. by Timoleon; but in 311 B.C. Agathocles massacred 5000 of its citizens, and finally Phintias of Akragas founded, about 284 B.C., a city under his own name (the modern Licata), and compelled the Geloans to remove thither, after which it disappears from history until Frederick II. refounded it in 1230. On high ground to the east of the town are the scanty remains of a Doric temple of the 5th century B.C.; and close by, in 1906, the stylobate of an earlier temple (6th century) dedicated to Athena, with fine architectural terra-cottas, was found. The cemeteries of Gela, excavated in 1900–5, have yielded numerous fine vases, now in the Syracuse museum: those from earlier excavations are in private collections or in foreign museums.

Terranova Pausania, or TERRANOVA DI SARDEGNA, a seaport of Sardinia, 72 miles E. of Sassari by rail, now, as in ancient times when it bore the name of Olbia, the port of embarkation for Italy. Its foundation is attributed by Pausanias (x. 17, 5.), with whom the name Pausania has no connection, to the Thespians and Athenians under the leadership of Iolaus. Remains of the ancient walls have been found. The 11th century Romanesque church of S. Simplicio contains a large collection of Roman milestones from the road from Olbia to Cagliari (q.v.; anc. Carales). Pop. 6600.

Terrapin, the popular name of many species of fresh-water and tidal-water tortoises of the family Testudinidæ, natives of tropical and the warmer temperate countries. About twenty fresh-water species are found in the United States. But the terrapin *par excellence* is *Malacoclemmys terrapin,* the diamond-back salt-water terrapin, highly prized as a delicacy for the table. It is caught in salt marshes along the coast from New England to Texas, the finest being, however, those of the Massachusetts and the northern coasts. Another species is *M. geographicus,* with peculiar map-like markings; and there are several species of Pseudemys. 'Brer Tarrypin' is an intelligent and genial interlocutor in many of the beast stories of *Uncle Remus.* See TORTOISES AND TURTLES.

Terra Rossa, a name given to a ferruginous red earth which is extensively developed in the limestone districts of south-eastern Europe, especially in Istria and Dalmatia. See RED EARTH.

Terre Haute (*Terre* pron. *Ter-re*), capital of Vigo county, Indiana, on the river Wabash (crossed here by three bridges), 72 miles by rail WSW. of Indianapolis and 178 S. of Chicago. It is regularly built on a plateau some 60 feet above the river, and, being within a dozen miles of the great block-coal mines of Clay county, contains numerous foundries, rolling and other mills, and factories. There are oil-wells in the neighbourhood, and grain is grown. Its public institutions include the state normal school, a college, a polytechnic and other institutes, an orphans' home, &c. Pop. (1870) 16,103; (1900) 36,673; (1910) 58,157; (1920) 66,083.

Terrestrial Magnetism, &c. See MAGNETISM, TEMPERATURE, &c.

Terrier, a name originally applied to any breed of dog used to burrow underground, but now applied to any small dog. Terriers may be divided into three classes: those able to follow their game into its earth, those kept for hunting above-ground, and those kept merely as companions. Among terriers proper the Fox-terrier (q.v.) holds the position of greatest popularity. The Scotch terrier, though long familiar in Scotland, only became generally known about 1870, but has spread very rapidly since then. Weighing from 16 to 20 lb. he is a small, compact dog, short in the leg; body of moderate length, with pronounced hind-quarters; coat short, hard, dense, and with no semblance of a curl; ears erect; and with a keen, bright expression. In character he is generally alert and active, and makes a splendid companion. Allied to the Scotch terrier is the white West Highland terrier, with body compact and deep, and powerful jaws. The best weight is about 16 lb. The Cairn terrier is doubtless related to the Skye terrier; it is small, deep-chested, has a long jaw and blunt muzzle; weight about 14 to 16 lb. Another variety used for going to ground is the Dandie Dinmont, called after the character in Scott's novel of *Guy Mannering*, a character founded on James Davidson (d. 1820), a well-known Border farmer, who was one of the founders of the breed, The Dandie is a low and powerful dog, very courageous, a quality probably gained by an admixture of bulldog blood, but headstrong and difficult to keep under control. Dandies are divided into 'peppers' and 'mustards'—i.e. those coloured slate-blue and those of a light yellow. They should weigh about 18 lb. The coat is rather longer than the Scotch terrier, but not so hard. The small, hard-coated Sealyham terrier, scaling about 18 lb., apparently traces its ancestry to Fox-terrier, Dandie Dinmont, and Bull-terrier sources.

Among terriers kept for hunting above-ground the most popular is the Irish terrier, a dog larger and considerably leggier than the fox-terrier, but built on the same lines. The coat is hard and wiry, neither long nor shaggy, bright-red or wheaten-red in colour. The ears used always to be cut to a fine point, standing erect, but are now allowed to fall over in their natural shape. The Kerry terrier (Kerry Blue) is a variety of Irish terrier, blue in colour and weighing as much as 40 lb. or more. The Border terrier, blue, wheaten-red, or even white in colour, resembles the Irish terrier. The Bedlington (q.v.) is popular in the north of England. The Bull-terrier (see BULLDOG) also makes a good sporting dog, but is kept mainly as a companion; the Boston terrier, very popular in the United States and in Canada, is a similar dog. The Black-and-Tan or Manchester terrier, showing traces of the Bull-terrier and Whippet, once gave promise of popularity, but has fallen away; its coat is short and glossy, with the tan distinctly marked off. The large dogs weigh from 14 to 22 lb., and the 'toy' variety not more than 7 lb. The Yorkshire terrier is an important-looking 'toy' dog, weighing from 5 to 7 lb. A rich 'fall' of tan hair covers its head, while its body coat is of moderate length and bright steel-blue in colour. The English White terrier is similar to the Black-and-Tan, except that it is white; it is a breed not often met with nowadays. Airedales have attained considerable popularity both as sports dogs and as companions. They are vigorous animals, weighing normally from 40 to 45 lb. or more, and must be carefully trained. Head, ears, and legs are tan, the body is black, and the hair hard and wiry. The Welsh terrier is a smaller but similar dog. The long-coated Skye terrier (q.v.) is somewhat less popular than formerly as a companion dog, and the closely-allied Clydesdale (Paisley) terrier is never likely to be much in evidence. The main points to be attended to in the case of terriers are cleanliness, abundance of exercise, regular feeding, and grooming. Frequent bathing should be avoided, as it softens the coat. See books by F. T. Barton (1907), D. Matheson (1922).

Territorial Forces. See VOLUNTEERS, &c.

Terror, REIGN OF. See DANTON, ROBESPIERRE.

Terry, DAME ELLEN, actress, was born at Coventry, on 27th February 1848. She made her first appearance on the stage when only eight years old, playing Mamilius in *A Winter's Tale* at the Princess's Theatre, under the management of Charles Kean. In 1858 she acted the part of Arthur in *King John*, and in 1863 made her debut as a regular performer, playing Gertrude in *The Little Treasure* at the Haymarket. From 1864 to 1874 she practically retired from the stage, her only notable appearances being at the Queen's Theatre for a few months in 1867. In 1875 she made a great success in Portia at the old Prince of Wales's Theatre, where she remained for some time under the Bancrofts, playing in *Money*, *The Lady of Lyons*, *Masks and Faces*, and *Ours*. In 1876 she joined the Court Theatre, where her most notable character was Olivia, in Wills's play of that name. On 30th December 1878 she first appeared at the Lyceum in conjunction with Sir Henry Irving (q.v.), with whose brilliant successes her name is inseparably connected. She married G. F. Watts (q.v.), E. A. Wardell (Charles Kelly), and (1907) James Carew. See her *Story of My Life* (1908).

Terschelling, one of the chain of islands to the north of Holland. It consists of fertile arable and meadow lands, is protected on the south by large dykes, and in other parts by dunes, which are carefully preserved. Area, about 45 sq. m.

Tertian Fever. See MALARIA.

Tertiaries, a name given by church writers to a class in the Roman Catholic Church, who, without entering into the seclusion of a monastery, aspire to practise in ordinary life all the substantial obligations of the scheme of virtue laid down in the Gospel. It was under St Francis and the mendicant orders generally that the institute of Tertiaries reached its full development (see FRANCISCANS). Similar lay associations were organised in connection with the Dominican, Carmelite, and Augustinian, as well as with certain of the more modern orders; and a brotherhood of the same character had already been formed by the Templars. The institute of Tertiaries, properly so called, is quite distinct from that of the lay 'confraternities' which

exist in connection with the several orders, and the objects of which are very similar.

Tertiary, or CAINOZOIC, the term applied in the science of Geology (q.v.) to a group of systems intervening between the Mesozoic rocks and the superficial deposits which are grouped as Quaternary or Post-tertiary. The Tertiary systems include Eocene, Oligocene, Miocene, and Pliocene.

Tertullianus, QUINTUS SEPTIMIUS FLORENS, a great theologian of the Western Church, was born of heathen parents at Carthage about 160. His father was a Roman centurion under the proconsul of Africa. The details of his life are little known, but the strongly marked character of the man comes out in every page of his numerous writings. He had a liberal education, and shows extensive acquaintance with poetry, history, and law, and considerable knowledge of philosophy and science, though he calls the philosophers 'the patriarchs of heretics' and the learning of secular literature 'folly with God.' He speaks of the delight he once had in the indecent profanities of the public plays, and confesses that he had fallen into the greatest sins. He nowhere says much about his personal religion, but calls himself 'a sinner of all brands, and fit only for penitence, and asks his readers to remember in their prayers Tertullian the sinner.' He had sufficient command of Greek to write in that language his earliest treatises, all of which are lost. Jerome mentions that he was a presbyter of the Catholic Church, whether at Rome or Carthage is unknown. Tertullian himself speaks of his having lived at Rome. Eusebius says 'he was accurately acquainted with the Roman laws, and one of the most distinguished men in Rome.' It is possible that before his conversion he had practised there as an advocate or rhetorician. He did not become a Christian till about 190, and he has not recorded the history of his conversion. That he was married is shown by his two books *Ad Uxorem*, in which he argues against second marriages. Some time between 199 and 203 his opposition to the spirit of worldliness in the church culminated in his becoming a leader of the Montanist sect. According to Jerome, this was owing to 'the envy and insults of the clergy of the Roman Church,' but the chief causes were doubtless the uncompromising character of his natural disposition, and his repugnance to the laxity of the Roman clergy in their reception of the *Lapsi*, and very probably the favour shown to the Patripassian heresy by the Roman bishops Zephyrinus, and Callistus. He died probably between 220 and 240, at all events 'in decrepit old age' (Jerome). Augustine says that he at last withdrew from the Montanists, and 'propagated conventicles of his own,' which is rendered less likely by the fact that the Montanist sect survived in Africa till the 5th century, under the name of 'Tertullianists.'

Tertullian was a man 'of an eager and vehement disposition' (Jerome), who threw all his great gifts of learning, imagination, eloquence, and wit into the religious controversies of his time for thirty years (190–220). Along with the Roman love for substantiality and strength, he had the 'bitter, stern, and harsh temper' which Plutarch ascribes to the Carthaginians. He wanted the sweet reasonableness and calmness, the feeling for harmonious form, and the instinct for speculative thought that distinguish the greatest Greek fathers of the church. He had the heart of a Christian with the adroit intellect of an advocate. His aim is always to make his adversaries appear ridiculous and contemptible. He pours unsparingly upon them a fiery stream of strong argument and satire, mixed with the sophisms, insinuations, and hyperboles of a special pleader. His style is most vivid, vigorous, and concise, abounding in harsh and obscure expressions, abrupt turns, and impetuous transitions, with here and there bursts of glowing eloquence, reminding the reader at one time of Carlyle, at another of Lamennais. What appear to be African provincialisms Niebuhr contends are only words and expressions taken from the ancient Latin writers. He was the first to give such words as *persona, liberum arbitrium, trinitas, satisfactio, sacramentum, substantia*, &c. the place they hold in Christian theology. Many sentences of Tertullian's, as, for example, 'the blood of the martyrs is the seed of the church;' 'Christ is truth, not custom;' 'It is absolutely credible because absurd—it is certain because impossible;' 'the human race has always deserved ill of God;' 'the unity of heretics is schism;' 'it is contrary to religion to compel religion;' 'how wise an arguer does ignorance seem to herself to be,' have become proverbial. 'Who can sufficiently extol the eloquence of Tertullian!' exclaims Vincentius of Lerinum; 'almost every word conveys a thought, every sentence is a victory. He is among the Latins what Origen is among the Greeks —the greatest of all.' Like Origen, Tertullian was a man of great genius, sincerity, and zeal, a vigorous ascetic, and an indefatigable worker, and, though wielding great influence over his contemporaries, was never more than a presbyter. Like him, too, this champion of the Christian faith against all opponents, Jews, heathens, and heretics, was himself a heretic to the majority of the Christians of his time. Both show the same contempt of the world and enthusiasm for martyrdom. But in the tendency of their views the contrast between them is as striking as in their natural temper and their literary style. Tertullian is an intense realist, with leanings towards materialism, Origen a pure idealist. Origen, like Justin, holds that Greek philosophy was 'a preparation for the Gospel,' 'a fragment of eternal truth from the theology of the ever-living Word.' Tertullian thinks that 'philosophers are blockheads when they knock at the gates of truth,' and that 'they have contributed nothing whatever that a Christian can accept.' 'The eloquence of the one,' says Pressensé, 'is broad and transparent like his genius: it is a noble, full, majestic river: that of the other is a turbid mountain-torrent. Origen speaks to philosophers as a Christian philosopher: Tertullian is a tribune of the people passionately haranguing the crowd in the forum or at the cross-roads; he is the ancient orator, with his vehement gestures, his vivid images, his grandiose pathos.'

His writings have been called 'Tracts for the Times.' Most of them are short. They are a rich mine of information as to the relations between Christians and heathens in his time. Though perhaps not the first of the Latin Christian writers, Tertullian was the creator of ecclesiastical Latinity, and impressed upon the language a new character, as he bent it to the service of Christian ideas. His works are divided into three classes: (1) Controversial writings against heathens and Jews. His *Apologeticus* (ed. by Woodham, 1843; by Bindley, 1891), addressed to the Roman authorities, is an attempt to establish the Christians' right to toleration. A popular edition of this work is presented in his two books *Ad Nationes*, possibly, as Uhlhorn and Hauck believe, of earlier date. *Ad Scapulam* is a bold rebuke of the persecuting Roman proconsul Scapula. In his *De Testimonio Animæ* he acutely develops the thought that Christianity responds to the religious necessities and postulates of human nature. The treatise *Adversus Judæos* is to prove that prophecy is fulfilled in Christ.

(2) Against heretics. Against these Tertullian takes his stand, as Irenæus did before him, on the

old apostolical tradition as the fixed foundation of belief. He formulates this position juristically in his *De Præscriptione Hæreticorum*. Against the Gnostic attempts to volatilise Christianity in Gnostic spiritualism he maintained its reality as a practical form of life in his *De Baptismo*, *Adversus Hermogenem*, *Adversus Valentinianos*, *De Anima* (in which he contends that even the soul is material), *De Carne Christi* (against Docetism), *De Resurrectione Carnis*, and the five books *Adversus Marcionem*. Against the Patripassian heresy he wrote the book *Adversus Praxean*.

(3) Practical and ascetic treatises. It is especially in these writings relating to Christian life and discipline that we can trace Tertullian's increasing hostility to the church and adoption of the Montanist views, which had great influence among African Christians. He hailed the testimony of 'free prophecy' as God's witness against the laxity which the Catholic Church had shown in dealing with the sensual weaknesses of the great multitude within her pale. Hence the division of these treatises into *Pre-Montanist* and *Montanist*. To the former class belong *De Baptismo*, *De Pœnitentia*, *Ad Martyres*, *De Spectaculis*, *De Idolatria*, *De Cultu Feminarum*, *De Oratione*, *De Patientia*, and *Ad Uxorem;* to the latter, *De Corona*, *De Fuga in Persecutione*, *Scorpiace*, *De Exhortatione Castitatis*, *De Monogamia*, *De Pudicitia*, *De Jejunio*, *Adversus Psychicos*, and *De Pallio;* while *De Virginibus Velandis* marks the transition stage.

Tertullian had a greater influence on the Latin Church than any theologian between Paul and Augustine. His Montanism indeed prevented it from being exercised directly, but Cyprian, who called Tertullian 'his master,' was the interpreter who gave currency to his views. The following is a summary of Harnack's estimate of Tertullian (3d vol. of his *Dogmengeschichte*), whom he calls 'the founder of Western Christianity.' Tertullian's Christianity was moulded by the enthusiastic and strict faith of the early Christians on the one hand, and by the anti-Gnostic *regula fidei* on the other. A trained jurist, he sought to express all religion in legal formulas, and conceived the relation between God and man as one of civil law. 'God appears always as the powerful partner, who watches jealously over his rights.' Further, his theology shows a syllogistic-dialectic stamp; it does not philosophise, it reasons, using now the argument *ex auctoritate*, now the argument *e ratione*. He shows striking power of psychological observation. Finally, his writings have a strong practical evangelic tendency; with their vivid appeal to the reader's will, and their simple concrete expression of the Gospel, they appealed not to theologians only, but to all. In these characteristics, and their union, Tertullian became the type of the Christianity of the Western Church.

The best complete edition of Tertullian's works is still that of Oehler (3 vols. Leip. 1853–55). A complete critical edition in the Vienna *Corpus Script. ecclesiast. Lat.* began in 1890. The most important studies are those of Kaye (*Eccles. Hist.*, 3d ed. Lond. 1845), Neander (*Antignosticus*, 2d ed. Berlin, 1847; Eng. trans. by J. E. Ryland, 2 vols. 1851), Pressensé (in his *Histoire des Trois Premiers Siècles de l'Église Chrétienne*, 1858–77; Eng. trans. 4 vols. 1879), Böhringer (*Biographien*, vol. iii. 2d ed. Leip. 1875), Möhler (in his *Patrologie*, vol. i. Regensburg, 1840), Grotemeyer (Kempen, 1863–65), Freppel (Paris, 1864), Hauck (with a selection of characteristic extracts, Erlangen, 1877), J. M. Fuller (in the *Dictionary of Christian Biography*, 1887), Farrar (*Lives of the Fathers*, vol. i. 1889), and Ernst Noeldechen (*Tertullian dargestellt*, Gotha, 1890). See also Harnack, *Dogmengeschichte* (2d ed. 1888–90), N. Bonwetsch, *Die Schriften Tertullians* (1878); Koffmane, *Geschichte des Kirchenlateins* (vol. i. Berlin, 1879); Van der Vliet, *Studia ecclesiastica. L. Tertullianus* (Leyd. 1891); Monceaux, *Histoire littéraire de l'Afrique chrétienne* (Paris, 1901); D'Ales, *La Théologie de Tertullien* (Paris, 2d ed. 1905); Turmel, *Tertullien* (2d ed. Paris, 1905); Hoppe, *De sermone Tertullianeo* (Marburg, 1897), *Syntax und Stil des Tertullian* (Leipzig, 1903); Bardenhewer, *Geschichte der altkirchlichen Litteratur* (Freiburg, 1903); R. E. Roberts, *The Theology of Tertullian* (1917). A bibliography is given in J. E. B. Mayor's *Bibliographical Clue to Latin Literature* (1875), which is brought up to date in the introduction to his *Tertullian's Apology* (1917). Translations of nearly all Tertullian's works are included in Clark's *Ante-Nicene Christian Library*.

Teruel, a town of NE. Spain, capital of the province of the same name, stands on the river Guadalaviar. Its cathedral and its great aqueduct date from the 16th century and there are some interesting churches. Pop. 12,000.—The province, once part of the kingdom of Aragon, contains several mountain ridges. The river Tagus rises in the west of the province and flows west; several other rivers flow north to the Ebro. Corn, wine, fruits, timber, silk, and wool are the chief products, but there is considerable cattle-raising, and some manufacturing industry. The mineral wealth awaits exploitation. Area 5720 sq. miles; pop. (1920) 252,096.

Ter Vere. See CAMPVERE.

Teschen (Czech. *Těšin*; Pol. *Cieszyn*), the name of an ancient town and principality of Silesia. The town lies on the river Olsa on the border between Czechoslovakia and Poland, and, being a centre of communications, is a strategical point of some importance. Coke and gas coal are produced locally. In 1910 the Austrian principality, about 850 sq. m. in area, had a population of 426,000, more than half Polish-speaking. After the Great War considerable friction and some bloodshed arose between Poland and Czechoslovakia over the partition of the Teschen area. The plebiscite method, proposed in 1919, was discarded, but in July 1920 an agreement was concluded at the Ambassadors' Conference. The greater part of the territory, including the town, was awarded to Poland; the western portion, with the coalfields and a suburb of the town, went to Czechoslovakia.

Tesla, NIKOLA, born the son of a Greek priest at Smiljan, in Croatia, in 1857, studied at Graz and Prague, and in 1885 joined Edison at Menlo Park, but left him in order to work out in New York his own ideas, such as telegraphy through the earth without wires, the securing of an effective electric light by means of Vacuum Tubes (q.v.), the controlling of a torpedo boat from the shore by electricity, the utilisation of alternating electric current, the induction motor, and the perfection of electrical apparatus—transformers, dynamos, condensers, &c.

Testacella, a genus of carnivorous slugs, represented in Britain by two or three species, probably imported with plants from the continent. The shell is a mere vestige at the posterior end of the body. The animals are burrowers but often come up at night (especially in spring and autumn or after continued wet weather); they bury themselves deeply in prolonged drought; they lie dormant in the ground through the winter. They creep quickly and feed on earthworms, which they harpoon with their jerked-out toothed proboscis and swallow whole.

Test Acts, acts meant to secure that none but rightly affected persons and members of the established religion shall hold office, include all such acts as enforce oaths of Abjuration, Allegiance, Supremacy, or, amongst the clergy, Uniformity; as well as the Corporation Act of 1661, requiring

members of corporations to receive the sacrament after the manner of the Church of England. But the term is specially used of two English statutes imposing certain oaths on the holders of public offices, and directed against Catholics. The act of 1673 directs that all magistrates shall take the oaths of allegiance and supremacy, as well as an oath renouncing the doctrine that it is lawful to take arms against the king, and provides that they must receive the communion according to the rites of the Church of England within a year before their election. A Scottish act was passed in 1681. Another act of 1685 imposed the like conditions on the holders of all public offices, civil and military, and obliged them in addition to abjure all belief in the doctrine of transubstantiation. These acts, which were practically evaded to a large extent by means of an act of indemnity passed every year, and were at various times partially repealed, were not finally repealed till 1829. In Scottish church history of the 17th century 'taking the test' meant taking the oaths, abjuring the Covenant, and recognising the reigning king, oaths enforced on all and sundry, especially on Covenanters, during the 'killing times.' The universities had their own special tests, now abolished save in the case of offices with clerical functions. See OATH.

Testament. See BIBLE, WILL; and for apocalyptic testaments, TWELVE PATRIARCHS.

Testing Clause, in a Scottish deed, is the last clause, which narrates when and where the parties signed the deed, before what witnesses, the number of pages of which the deed consists, and who was the person who penned the deed. Moreover, if there have been any interlineations or erasures of important words during the engrossing, these should be mentioned in this clause. The clause is an essential part of a Scottish deed, and no deed written by another than the party is valid unless the testing clause is regular. See DEED.

Test-papers are made by dipping unsized paper into an alcoholic solution of a vegetable colouring matter which changes colour when exposed to the action of an acid or alkaline solution. The paper, after being gently dried, is cut into slips of a suitable size. Hence, by dipping the appropriate test papers into any solution, we can ascertain whether it is acid, alkaline, or neutral. Litmus and turmeric are most commonly used as the colouring matters; litmus for the detection of acids, and turmeric for that of alkalies. Test-papers are also employed for detecting sulphuretted hydrogen, &c., and for such a purpose the paper must be dipped in the solution of an appropriate substance. Thus acetate of lead paper becomes black in presence of sulphuretted hydrogen, while starch paper becomes blue when touched with iodine.

Testudo. See TORTOISE.

Tetanus (derived from the Gr. *teinein*, 'to stretch'), or LOCK-JAW, is one of the most formidable diseases of the nervous system, and is characterised by an involuntary, persistent, intense, and painful contraction or cramp (see SPASM) of more or less extensive groups of the voluntary muscles, nearly the whole of the body being sometimes affected. Hippocrates (4th century B.C.) mentions tetanus as a serious complication of wounds involving bones and joints. The condition follows most commonly a lacerated wound contaminated with dirt; but it may develop after a slight scratch or even some other injury of the skin, such as frostbite or chilblain, which has been similarly soiled. Among soldiers in the Great War, tetanus was a dreaded consequence of shell wounds, and among the civil population gardeners and stablemen are supposed to have more than the average liability to its onset.

The first symptom noticed in some cases is rigidity of the jaw (*trismus*), which may become so pronounced even within twenty-four hours that the mouth cannot be opened at all. In other cases, discomfort in the throat and difficulty in swallowing are first noticed. Sometimes the first spasm consists in a hardness of the muscles round the wound by which infection has entered the system; and this may either remain the only part affected (local tetanus) or the spasms may become general throughout the body (general tetanus). The neck, in general tetanus, feels stiff within a few hours, the mouth is opened with difficulty, the jaw may be tightly clenched, and at a later stage the face has a peculiar fixed smile (*risus sardonicus*). The disease spreads so as to affect the other muscles of the trunk and limbs. Owing to spasm in the powerful muscles of the back, the body becomes strongly arched backwards (*opisthotonos*), or it may occasionally be twisted to one side or bent forward. The hands and feet are however seldom much, if at all, affected. These muscular contractions are very painful; a particularly acute pain may be present in the lower part of the chest due to spasm of the diaphragm. Some of the affected muscles, for example those of the abdomen, are so rigid as to be board-like to the touch, and it is not usual for the spasm to remit completely till the disease finally passes away. Aggravated spasms on the other hand come on, while the disease is at its height, every quarter of an hour or so, and last for several minutes; and if the patient is sinking, these paroxysms become more frequent. They may occur spontaneously, or may be induced by the slightest disturbance—a touch, the opening of a door, or the least attempt at movement. A distressing feature is that consciousness is fully maintained as a rule, and when the violent spasms occur, the patient assumes an agonised expression. The tongue may be bitten during a spasm, which is sometimes so violent as to break the teeth or rupture powerful muscles. Death results from a mixture of causes, but mainly from want of breath due to the rigid condition of the respiratory muscles, associated with general weakness, and flagging of the heart's action. There may be no fever during the course of the disease, and even if it is present it is not usually high; but sometimes, just before death, the temperature becomes extremely high (110° or 112° Fahr.). The mortality in untreated cases is said to be about seven deaths to every one recovery, but generally those cases which are slow in development are much milder and less fatal than more acute cases. During the war when all the wounded received protective doses of antitetanic serum, the mortality varied from 6 per cent. to about 22 per cent. of all those who developed this disease.

Tetanus at its commencement is sometimes mistaken for rheumatism, or for simple sore throat if the throat muscles are early affected, and it has some resemblance to Hydrophobia (q.v.). It may be closely imitated by hysteria, but particularly by poisoning with nux vomica or its alkaloid strychnine. In these cases there is less persistent rigidity between the spasms.

The *cause* was long suspected to be a micro-organism, since tetanus became much less common as a result af operations after the introduction of Antiseptic (q.v.) methods. Nicolaier (in 1884) first described the sporing bacillus now known to cause the infection, and Kitasato (1889) obtained it in pure cultures and completely demonstrated its relationship to the disease. The manner in which the bacillus produces its dangerous effects is that as it multiplies in the wound it produces

substances (toxins) which are powerfully irritant to the nerve cells of the body; these pass up the lymphatic spaces of the nerves and later into the blood, thus finding their way into the central nervous system where they poison the cells and so bring about the excessive muscular contractions. Methods have been devised whereby animals can be rendered 'immune' or incapable of inoculation with tetanus. The serum of horses thus protected is capable of conferring protection upon other animals into which it is injected; this antitoxic serum is therefore used as a means of preventing or even of curing the disease.

In *treatment* of so serious a disease, prevention is of the highest importance. During the war, every British soldier who chanced to be wounded, no matter how slightly, received as part of the first dressing an injection of tetanus antitoxic serum (500 units, later raised to 1500 units); and as he passed through hospitals three further injections were given at intervals of a week. In the event of tetanus occurring in spite of this precaution, much larger doses were given both into the muscles and directly within the spinal membranes (16,000 units). When the treatment was carried out at an early stage of the spasms, the patient appeared to stand a better chance of recovery. Perfect quiet, a darkened room, and avoidance of all causes of irritation are necessary in the treatment of a case presenting the spasms. Drugs are useful in controlling the violence of the muscular contractions, among which may be mentioned the prolonged inhalation of chloroform and chloral or morphine in large doses.

Tetany is a rare and little understood disease of the nervous system, occurring both in children and adults, characterised by recurring attacks of tonic spasm of various muscles, particularly those of the fingers and toes. It is associated with defective hygienic conditions, imperfect ventilation, poor diet, and in children with Rickets (q.v.). It is often relieved by administration of extract of the parathyroid glands. Complete recovery generally ensues; fatal cases are very rare.

It is not yet definitely settled to which of these two very different diseases *tetanus* or *trismus neonatorum* (of newborn children) should be referred. It has been supposed on the one hand to be traumatic tetanus, due to the injury to the umbilical cord at birth, and resembles it in its great fatality, and in the extension of the spasms over the larger muscles (of trunk, &c.); the opposite view, that it is an extremely aggravated form of tetany, is supported by the facts that the muscles of the fingers and toes are specially affected, and that improved ventilation alone has been known to produce a great diminution of the disease in lying-in hospitals.

Tetanus, or lock-jaw, both traumatic and idiopathic, occurs in most of the domesticated animals, but most frequently in horses. It is due to the action of a microbe, the *Bacillus tetani*, which gives rise to the formation of a toxin termed *tetanine*, by the action of which the tetanic symptoms are induced. This bacillus is also found in garden-mould, and tetanus is induced by the entrance of the microbe into a wound or exposed structure. Tetanus has been transmitted from diseased to healthy animals by inoculation. The symptoms usually come on gradually, involve most of the muscular structures, which become hard and rigid; the nose is protruded, the limbs move stiffly, the tail is raised, the bowels are constipated. The patient must be kept perfectly quiet, and in an airy but fairly warm place, and plentifully supplied with cold water, and with soft, sloppy, but nutritive food, which he will usually greedily suck in through his firmly-closed teeth. A full dose of purgative medicine must at once be given; extract of belladonna repeated twice or thrice daily is occasionally serviceable; any discoverable wound or injury should be fomented and disinfected, and all causes of irritation avoided. An antitetanic serum is now prepared from cultures of the bacillus, and is injected hypodermically as a means of treatment. Except in the most acute cases, it is very useful if given in time, but is most valuable as a preventive.

Tetbury, an old market-town of Gloucestershire, 5 miles NW. of Malmesbury; pop. 1600.

Tête de Pont. See BRIDGE-HEAD.

Tetrao. See GROUSE, BLACKCOCK, CAPERCAILZIE.

Tetrarch (Gr. *tetrarchēs*, Lat. *tetrarcha*, 'governor of the fourth part,' i.e. of a country), a title originally designating what is signified by its etymology, the governor of one of four divisions of a kingdom or country; but in the usage of the later Roman empire given undistinguishingly to all minor rulers, especially in the East, possessing sovereign rights within their territory, but dependent on the emperor, and in many cases removable at his pleasure. This was especially the case in Syria, where the princes of the family of Herod are called indiscriminately by this title (Luke, iii. 1) and by that of king (Matt. xiv. 9).

Tetrazzini, LUISA, Italian singer, was born in 1871 at Florence, studied singing there, and made her début in 1890. She has appeared in most of the principal European opera-houses, has toured in North and South America, and in 1921 published *My Life of Song*. As a coloratura soprano, she appeared mostly in the operas of the old Italian school, Donizetti, Bellini, Meyerbeer, &c.

Tetschen (Czech. *Děčin*), a town of Czechoslovakia, situated on the right bank of the Elbe, 50 miles north of Prague. The town has an historic castle, an agricultural school (1850), a busy river traffic, and manufactures of chemicals, paper, textiles, &c. Pop. 11,200.

Tetter, the popular name for skin diseases of the kind described under PSORIASIS and HERPES.

Tetuan (Arab. *Tetawin*), a port of Morocco, capital of the Spanish zone, about 4 miles from the sea, 22 miles S. of Ceuta. The old Moorish town is surrounded by walls, flanked with towers, and is defended by a castle; the Spanish town outside has pleasant markets. Its harbour does not admit large vessels; but a brisk trade is carried on, mainly by the Jews, in fruit, wool, silk, girdles, leather, cotton, &c., and it exports provisions largely to Ceuta. Tetuan was taken by the Spaniards under O'Donnell (q.v.), February 1860, but was evacuated next year. Pop. 24,000.

Tetzel, JOHN, the famous seller of indulgences, was born at Leipzig about 1455, and in 1489 entered the Dominican order. His ability and success as a preacher led to his being entrusted in 1516 with the charge of preaching an indulgence in favour of contributors to the fund for building the church of St Peter's at Rome (see INDULGENCE). It was in opposition to him that Luther published his celebrated theses, on the 31st October 1517. Tetzel published counter-theses and detailed replies, but was himself severely rebuked by the papal delegate Miltitz, for the extravagance in statement and other improprieties which had brought so much scandal upon the church. His personal character was the subject of controversy. He died of the plague at Leipzig in August 1519.

There are (hostile) Lives by Hofmann (1844) and Korner (1880), and from the Catholic point of view by Gröne (2d ed. 1860) and Hermann (2d ed. 1883). See also Kayser, *Geschichtsquellen über Tetzel* (1877), and the exhaustive study by Paulus (1899).

Teutoburger Wald, a mountain range of Germany, running in a north-westerly direction, mostly on the borders of Westphalia and Hanover. It is covered by many fine forests. A monument stands on the Grotenburg, near Detmold, erected to the memory of Arminius (q.v.), who defeated the Romans here in the year 9 A.D. See ARMINIUS.

Teutonic Knights, one of the three military-religious orders of knighthood founded during the period of the Crusades. Certain merchants of Bremen and Lübeck, witnessing the sufferings of the wounded Christians before Acre in 1190, were so moved with compassion that they erected tent-hospitals for them, and provided for surgical and nursing attendance. There had been a German hospital in Jerusalem from 1128 to 1187; and the new arrangement at Acre was in some sort a continuance of this, being called the Hospital St Mary of the Germans in Jerusalem. The new hospital, the attendants and founders of which formed themselves into a monastic order with the same rules as the Knights Hospitallers of St John, found a patron in Duke Frederick of Swabia, and through him secured the countenance of his brother, the Emperor Henry VI., and the confirmation of the pope (1191). Seven years later it was converted into a knightly or military order; and the change was stamped with the papal approval in 1199. The knights, in addition to the usual monastic vows, bound themselves to tend the sick and wounded and wage incessant war upon the heathen. Their distinguishing habiliment was a white mantle with a black cross. The chief officer of the order was the grand-master or 'high-master,' who was assisted by five other dignitaries. The chapter consisted of these six officers in conjunction with the provincial masters. The minor districts and individual castles were governed by commanders, who constituted also the respective provincial councils. There was, moreover, a class of 'serving brothers,' who performed menial offices about the hospitals; and to these were added in certain places a class of inferior female domestics called 'half-sisters.'

About the year 1225 the Duke of Masovia (in Poland) invited the Teutonic Knights to come and help him against the heathen Prussians. The grand-master, Hermann von Salza, sent a body of knights, who experienced little difficulty in establishing themselves in the territories of the heathen. Twelve years later they were strengthened by the absorption into their order of the Brethren of the Sword, a military order which had been formed to convert to Christianity with the sword the Livonians, Esthonians, and Courlanders. At length the successive encroachments of the knights roused the Prussians to bitter opposition. A fierce warfare was then carried on for nearly a quarter of a century; but by 1283 the knights were masters of the territory lying between the Vistula and the Memel, and as heirs of the extinct Brethren of the Sword they had also extensive possessions in Livonia and Courland. In 1309 the executive officers of the order established themselves in the great castle of Marienburg, near the Vistula. After subduing the Prussians, the order entered upon a hundred years' contest against the Lithuanians. But a most serious blow was struck at the knights by the conversion of the Lithuanians to Christianity and the accession (1386) of their prince to the throne of Poland. From this time, having lost their main *raison d'être*—fighting against the heathen—the order began to decline. During the period of its prosperity, however, it had acted as the principal force in the politics of the Baltic countries; and both by its own exertions and by the encouragement it gave to the Hanseatic traders it was the means of spreading German civilisation and manners throughout the coast-lands of the south-eastern Baltic. The order suffered an incalculable loss of prestige through the terrible defeat inflicted upon them by the Poles and Lithuanians at Tannenberg in 1410. A desperate attempt to recover their power resulted (1466) in the loss of West Prussia and the alienation of the esteem and affection of their subjects in East Prussia, which they could only retain as a fief of Poland. In 1525 the order was secularised; its grand-master, Albert of Brandenburg-Anspach, being created hereditary duke of Prussia under the suzerainty of Poland. The headquarters of the order—for it still possessed several estates scattered throughout the German empire and in one or two other countries—was fixed at Mergentheim in Swabia, and its possessions were reorganised in twelve bailiwicks. Thus it existed until 1801, when the estates west of the Rhine were annexed by France; in 1809 the order was entirely suppressed by Napoleon in all the German states. This left only a couple of bailiwicks in Austria and one at Utrecht; of which the latter still exists, severely aristocratic. The Austrian branch, reorganised in 1840, justified its existence by maintaining an organisation for the care of the wounded in war.

See Voigt, *Geschichte des deutschen Ritterordens* (1859); Lohmeyer, *Geschichte von Ost- und West-Preussen* (1880); and Perlbach, *Statuten des Deutschen Ordens* (1890).

Teutonic Languages. See PHILOLOGY; also ENGLISH LANGUAGE.

Teutons, a group of peoples speaking Teutonic tongues, an important division of the Indo-Germanic family of languages. The name is derived from the ancient Teutones (and is a form of the modern German *Deutsch*, O. H. Ger. *Diutisc*, or Gothic *Thiudisko;* see GERMANY). The Teutonic peoples, as they exist at the present day, are divided into two principal branches: (1) Scandinavian, embracing Danes, Swedes, Norwegians, Icelanders; and (2) West Germanic, which includes, besides the German-speaking inhabitants of Germany proper (see GERMANY) and Switzerland (q.v.), also the population of the Netherlands (the Dutch), the Flemings of Belgium, and the descendants of the Angles, Saxons, and Jutes in Great Britain, together with their offspring in North America, Australia, and other British colonies—the English-speaking peoples of the world. For the extinct East Germanic branch, see GOTHS. It is necessary in this case, as in all similar cases, to guard against making language the test of race. See the articles on the several Teutonic lands; EUROPE; PHILOLOGY.

Teviot. See ROXBURGHSHIRE.

Tewfik Pasha, MOHAMMED (1852–92), Khedive of Egypt, the eldest son of Ismail Pasha, succeeded on his father's abdication in 1879, in virtue of the arrangement of 1866 between Ismail and the Sultan. The chief events of his reign—the insurrection of Arabi, the war with the Mahdi, the pacification of the Sudan frontiers, and the steady improvement of the condition of Egypt under English administration—have been indicated at EGYPT. Tewfik, a pious Moslem, utterly alien to his father's love of luxury and extravagance, was throughout loyal to his engagements with Britain.

Tewkesbury, a quaint old market-town of Gloucestershire, on the Avon at its confluence with the Severn, 8 miles NNW. of Cheltenham, 10 NNE. of Gloucester, and 15 S. by E. of Worcester. On the site of the cell of the hermit Theoc, from whom the place got its name, was founded in 715 a monastery, refounded in 1102 by Robert Fitzhamon as a great Benedictine abbey. Its noble

church, consecrated in November 1123, measures 317 feet by 124 across the transepts, and remains essentially Norman, in spite of later additions—Early English, Decorated, and Perpendicular. It was restored by Scott in 1875–79. Special features are the west front and the massive central tower, 132 feet high. The seven 14th-century windows are the chief glory of the choir. They were entirely releaded and rearranged in proper order to commemorate the 800th anniversary of the consecration of the abbey. Many of the Clares, Despencers, Beauchamps, and other lords of Tewkesbury are buried here, as also the murdered Prince Edward and (possibly) Clarence; and in 1890 a tablet was erected to Mrs Craik, the scene of whose *John Halifax* is laid in Tewkesbury. The place has also a town-hall (1788), a corn-exchange (1856), Telford's iron bridge over the Severn (1824), with a span of 176 feet, a free grammar-school, &c. The thick mustard Falstaff speaks of is a thing of the past, and the trade is chiefly agricultural. Within half a mile was fought (4th May 1471) the famous battle of Tewkesbury, in which the Yorkists under Edward IV. (q.v.) gained a crowning victory over the Lancastrians. First incorporated by Elizabeth in 1574, Tewkesbury returned two members to parliament from 1609 till 1867, one till 1885; it was merged in the county till 1918; since then it has united with Cirencester to return one member. Pop. 4800.

Texarkana, the name of two towns lying one on either side of the boundary between Texas and Arkansas. Though in different states they virtually form one town. Manufactures include textiles, and there is considerable trade. Pop. 19,700 (11,500 in Texas, 8200 in Arkansas).

Texas, the extreme south-western state of the American Union, is popularly known as the Lone Star State. It extends farther south than any other of the United States except Florida, and lies in 25° 51′—36° 30′ N. lat. and 93° 27′—106° 43′ W. long. Its very irregular boundary consists largely of natural lines formed by rivers and the Gulf of Mexico. Oklahoma lies to the north, Arkansas and Louisiana to the east, Mexico and the Gulf to the south, and New Mexico to the west. Texas not only is the largest state in the Union, but forms, with its area of 265,896 sq. m., nearly 9 per cent. of the total area of the United States, exclusive of Alaska. It is considerably larger than France. Its extreme length is about 825 miles, and its greatest breadth 750; the coast-line is 400 miles long. The surface of Texas is greatly diversified. From the low, flat prairie lands along the coast the land rises in a series of gradual elevations till it reaches the plateau and mountains of the distant west, where some of the peaks attain a height of 5000 feet above the sea. The coast is low and sandy. From the mouth of the Sabine River to that of the Rio Grande there extends a fringe of low islands and peninsulas, separated from the mainland by lagoons several miles in width. These islands are characterised by sand-dunes which rise about 20 feet above the beach. Padre Island, extending north from the mouth of the Rio Grande, is more than 100 miles in length. The alluvial coast-belt, extending from 25 to 60 miles inland, comprises both fertile lowlands and stretches of barren soil. In the waste portions there are extensive areas of cactus and thorny mesquite chaparrals. A white, sandy tract reaching south and west from Corpus Christi Bay to the Rio Grande is known as 'the desert.' Beyond this coast-plain lies a terrace of rich rolling land called the 'prairie belt.' In the eastern prairie sections there are extensive timber regions of live oak and deciduous forest trees, which cover an area greater than that of the state of Kentucky, not including two wide forest-belts called 'cross-timbers,' which extend southward from the Red River. To the north and west of the prairies the land rises and presents a rough, broken surface, with occasional bluffs. Much of the soil is fertile, and nearly all of it is excellently adapted for grazing. On the southern border of the plateau the elevation is about 1000 feet, but a height of 2000 feet is reached as the ascent continues toward the arid *mesas* of the *Llano Estacado* and the base of the Rocky Mountains, from which some outlying ridges extend into the state.

There is every variety of soil, from the fertile lands of the river-bottoms and prairies to the sterile sand of the southern desert. The coast-prairies have in general a sandy loam. In those of the interior there are heavier brown and black loams, while in the northern part of the state there are great areas of red lands. In the south and south-east, where fortunately much of the best land is located, the rainfall is ample, but the supply in the west and north-west is less reliable. However, it has been shown that even the *Llano Estacado*, or Staked Plains, which were once considered utterly uninhabitable, are capable of supplying plenty of water for irrigation by the use of artesian wells and windmills. The northern winds are usually dry, the rain comes almost entirely from the south-west, and the winter months are generally the driest. The best water-supply is found in the timber-lands. In a state extending through eleven degrees of latitude there is naturally found a considerable range of temperature. The climate on the coast-plains is semi-tropical, but is tempered by the winds from the Gulf. A dry, healthful climate prevails in the middle region, and the north experiences cool winters, with heavy snowstorms at times. The air of western Texas is so dry that meats are perfectly preserved in the open air without salt, and carcases of dead animals on the plains emit no odour. A notable feature of Texas climate is the 'norther,' which is a sudden and extreme change of temperature produced by a rush of cold wind from the north. This unwelcome visitor arrives usually unannounced, except for the fact that its coming is frequently preceded by a spell of warm weather. It ordinarily remains for three days, and the fall in temperature is often as much as 30°. The drainage of Texas is received by the Gulf of Mexico. The Red and the Arkansas rivers convey the waters of the northern part of the state to the Mississippi. The other streams flow directly into the Gulf. The Red and Sabine rivers and the Rio Grande form parts of the boundary line. Within the state the most important rivers are the Trinity, the Brazos, and the Colorado. With the exception of the Rio Grande, the Brazos, and the Sabine, nearly all the streams discharge their waters by means of large estuaries, from which steep clay banks rise for some height to the level of the prairie above. Knowledge of the details of the geological structure of Texas is quite imperfect. The coast-plains and prairies are of recent alluvial formation. Beyond these is a broad strip of Tertiary deposits, and farther inland the country belongs to the Cretaceous period, except in the central regions, which are penetrated from the north by contiguous arms of Jura, Trias, and Permo-Carboniferous formations. Texas is rich in minerals. It is one of the chief states producing petroleum, quicksilver, asphalt, and sulphur. It has large beds of coal and lignite. Silver, gold, copper, iron, lead, and zinc are mined, and natural gas is abundant. Building-stones of excellent quality occur in many districts; the supply of lime, gypsum, and salt is abundant; and cement production is important.

Agriculture and stock-raising have been the

leading occupations of Texas. Large tracts are still practically uninhabited, only one-sixth of the land being under cultivation, but settlements are encroaching each year upon the unreclaimed districts, and the primitive methods of the cattle-ranges are rapidly disappearing. Texas is pre-eminently a cattle-breeding state. The abundance of suitable pasturage and the genial climate give it advantages over many other sections. The old custom of sending young cattle in enormous 'drives' into other states, where they were sold to be fattened, has given place to owners 'ripening' their own cattle, thereby securing better prices, and opening the way for manufacturing industries connected with the preparation of beef and hides, and for the direct export of beef abroad from Galveston and New Orleans. Texas ranks first in cattle-raising, and in the number of sheep, horses, mules, and swine it is almost without a rival. The breeds of all varieties of live-stock have been very much improved. Wool and dairy-produce are important staples. Since 1883, when its crop surpassed that of Mississippi, Texas has been the leading cotton state; it produces about one-fifth of the world's cotton crop, and Galveston is the chief cotton exporting port of the United States. Wheat is an important crop, and the other grains are extensively cultivated. Sugar and rice yield abundant harvests along the coast, and fruits and vegetables in great variety are produced in the southern sections. The principal sugar district is the 'sugar-bowl' in the Brazos delta. Honey is another product of considerable value, and the output of timber—mostly yellow pine—is important. Manufactures are connected with the agricultural industry, and consist of refined petroleum, flour, cotton-seed oil, textiles, &c. The state capital is Austin (pop. 35,000). Other important towns are San Antonio (161,000), Dallas (159,000), Houston (138,000), Fort Worth (106,000), El Paso (77,000), Galveston (44,000). The Houston Ship Canal (1915) connects Houston with the Gulf of Mexico, and has made Houston a great cotton port. There is a state university at Austin, and there are numerous teachers' (normal) colleges, technical colleges, and sectarian institutions. The state has about 16,000 miles of railways, while 1000 miles of its inland waterways are navigable.

The earliest settlements in Texas were made in 1685 by the French, but the Spaniards followed a few years later. The country formed part of the Spanish province of Mexico, which in 1822 threw off the yoke and became a republic. On 20th December 1835 Texas declared itself independent of Mexico, and in 1836 Houston (q.v.) was made president. In 1845 Texas, with an area of 375,000 sq. m., was annexed to the United States. All its territory except that now enclosed within its borders was ceded to the United States in 1850 for the sum of $10,000,000. Texas had maintained continued war with Mexico, and its annexation was the prime cause of the war between that country and the United States. The state seceded from the Union 1st February 1861, and re-entered it 30th March 1870. The growth of Texas has been prodigious, and, though it ranks fifth among its sister commonwealths in population, it is in many aspects still in a transition period. In 1870 Texas had a population of 818,579, in 1880 of 1,591,749 (393,384 coloured), in 1900 of 3,048,710, and in 1920 of 4,663,228 (negroes, 741,694).

See Histories of Texas by H. Yoakum (2 vols. 1856), W. C. Baker (1873), H. S. Theall (1879), H. H. Bancroft (1885), and D. G. Wooten (2 vols. 1898); also W. B. Phillips, *The Mineral Resources of Texas* (Austin, 1915); T. H. Lewis, *Along the Rio Grande* (N. Y. 1916).

Texas Fever, or PIROPLASMOSIS. See RED WATER.

Texcoco (*Tezcuco*) a city of Mexico, on the east shore of the salt lake of the same name, 25 miles by rail ENE. of Mexico city. The ancient *Acolhuacan*, once the chief seat of Aztec culture, it still contains traces of old palaces and of a noble aqueduct. Pop. 6000. The salt lake has an area of 92 sq. m.

Texel, an island belonging to the province of North Holland, at the entrance to the Zuider Zee. It is separated from the mainland by a narrow strait, called the Marsdiep, and contains about 35,000 acres of arable and pasture lands. Its sheep are famous both for their wool and their cheese. The Marsdiep channel or part of it is also often called the Texel; and here or hereabouts many important naval battles have been fought. Blake defeated Tromp and De Ruyter in 1653; Prince Rupert fought De Ruyter in 1673; Duncan blockaded the Texel (for a time with a single ship) in 1797; and a Dutch fleet of twelve ships of war and thirteen Indiamen surrendered to Admiral Mitchell in 1799.

Textiles, fabrics produced by weaving. See the articles in this work on Weaving, Spinning, Cotton, Fibrous Substances, Hemp, Linen, Jute, Silk, Wool, &c.; also on Bleaching, Calico-printing, Dyeing, &c.

Thackeray, WILLIAM MAKEPEACE, one of the greatest of English novelists, came of a widely scattered family, whose members engaged in the army, the church, and the learned professions. The Thackerays were originally a race of small landholders settled at Hampsthwaite in Yorkshire. In fullness of time the younger sons began to leave their native village and try their fortunes in other walks of life. In 1711 we find the Rev. Elias Thackeray of Christ's College, Cambridge, established in the rectory of Hawkswell, Yorkshire. His nephew, Thomas Thackeray, became headmaster of Harrow School and the father of sixteen children; the youngest of whom, William Makepeace, was the grandfather of the novelist. This William Makepeace Thackeray went to Bengal in the East India Company's service, from which he retired in 1777 with a fortune. The fourth of his twelve children, Richmond Thackeray, born in 1781, was the father of the novelist. Richmond Thackeray also went to India in the Company's service, where he married Miss Anne Becher, a renowned Calcutta beauty, the daughter of a fellow civilian.

William Makepeace Thackeray, the only child of the marriage, was born on the 18th July 1811 at Calcutta. When he was five years old his father died; and soon after his mother married Major Carmichael Smyth, of the Bengal Engineers. She lived to survive her son. There were no children of the second marriage. On the death of his father, Thackeray, then a child of five years old, was sent home. He lived partly under the care of an aunt, Mrs Ritchie, who is recorded to have been surprised to find that her husband's hat fitted the little boy. At eleven he was sent to the Charterhouse, where he remained six years. Innumerable passages in his books prove that his schooldays had as important an influence on his art as the more adventurous boyhoods of Sterne and Dickens had on theirs. It should be added that the broken nose so conspicuous in all Thackeray's caricatures of himself was the accident of a school fight. While Thackeray was at school his parents returned from India and settled near Ottery-St-Mary in Devonshire, which is made the scene of the earlier chapters of *Pendennis*. In 1829 Thackeray was entered at Trinity College, Cambridge. He left the university after two years without taking his degree; but except from the

academical point of view his time was not wasted. Without being a scholar, he acquired a literary knowledge of the classics, and he gained all those indirect advantages which distinguish Oxford and Cambridge from other seats of perhaps purer learning. For one thing, Cambridge fixed his social status. Though afterwards he was to consort with Bohemians and other strange acquaintances into whose company a man is forced by adversity, he was never a Bohemian, and always faithful to the traditions of the class in which he was born and bred. It was at Trinity that Thackeray first appeared in print, the work being a burlesque of the prize poem on the subject of *Timbuctoo*, which had been won by Alfred Tennyson. 'A poem of mine,' he writes to his mother, 'hath appeared in a weekly periodical, here published and called the *Snob*. . . . Young had a pleasant wine party at which for a short time I attended. *Timbuctoo* received much laud. I could not help finding out that I was very fond of this same praise. The men knew not the author, but praised the poem.'

On leaving Cambridge Thackeray travelled for two years, in Germany for the most part, and on his return determined to go to the bar. It was necessary for him to choose a profession, as his fortune did not exceed some £500 a year. This, moreover, was soon diminished by losses from the failure of an Indian bank; and he was probably glad of an excuse to abandon the law for the more immediately remunerative pursuit of literature. From the very first he had a passion for drawing and literary composition, his fancy in both running to caricature. Early in 1833 he became a regular contributor to the *National Standard and Weekly Journal of Literature, Science, Music, Theatricals, and the Fine Arts*, a weekly journal, price twopence, edited by F. W. N. Bayley, Esq., a then well-known journalist. With the nineteenth number Thackeray took the editorship, and subsequently became the proprietor also. 'My *National Standard*, as usual,' he writes from the Garrick Club. 'It has increased in sale about twenty in the last month. At this rate I shall be ruined before it succeeds.' The paper finally came to an end after little more than a year's existence. But art, not literature, was Thackeray's real ambition at that time. 'I think,' he says in a discussion of plans which followed the family losses, 'I can draw better than do anything else, and certainly I should like it better than any other occupation.' And towards the end of 1833 he joined his parents at Paris to study painting seriously. 'I am sure we shall be as happy here as possible, and I believe I ought to thank Heaven for making me poor, as it has made me much happier than I should have been with the money. I spend all day now, dear mother, at the Atelier, and am very well satisfied with the progress I make.' But Thackeray was not destined to realise the ideals of the envied 'J. J.' of *The Newcomes*. Money was wanted, and could always be earned by the pen. It is curious to observe that Thackeray, who must, one would have thought, have been conscious of his genius for fiction, was content for years to work in the humble and practical walks of journalism. How much or what he wrote at this period is not known, but it is certain that his portrait appears in a conspicuous place in the group by Maclise of the contributors to *Fraser* which was published in the magazine for January 1835. It was at this time too that he made his famous application to illustrate *Pickwick*.

In 1836 Thackeray married Isabella, daughter of Colonel Shawe, of the Indian army. His bride brought him no fortune, and he must have known that his marriage plunged him in grim earnest into the battle of life. Years afterwards, writing to a friend, he says: 'I married at your age with £400, paid by a newspaper which failed six months afterwards, and always love to hear of a young fellow testing his fortune bravely in that way.' The newspaper which failed was the *Constitutional*, the property of the Metropolitan Newspaper Company, of which Thackeray's stepfather was chairman. It was started to rival the leading daily papers, but it only existed from September 1836 to July 1837, when it failed, carrying with it the rest of the fortune of Thackeray and his parents. During the first months of the life of the *Constitutional* Thackeray acted as Paris correspondent. Early in 1837 he moved with his wife to London, living first in Albion Street, Hyde Park, where his eldest daughter was born, and then at Great Coram Street. The marriage was a very happy one, and, in spite of the failure of the *Constitutional*, work was abundant and the future promising. Thackeray was writing regularly in the *Times*, which was then no less important than it is now, and also in the *New Monthly*, *Fraser's Magazine*, and in Cruikshank's *Comic Almanacks*. It is perhaps worth mentioning that in the *Times* he wrote the review of Carlyle's *French Revolution*. In 1838 was born a second daughter, who died in infancy; and in 1840 a third, Mrs Leslie Stephen, who died in 1875. The illness which followed the birth of the third daughter affected Mrs Thackeray's mind, and she never recovered, though she lived till 1894. This misfortune broke up the home. The children were sent to Paris to their grandmother, and for a year Thackeray travelled about with his wife from watering-place to watering-place, as the doctors recommended, but without result. The truth had to be realised, and Thackeray went back to London, alone and worse than alone. But his genius was by this time asserting itself, and, though his success in the vulgar sense of the word was not assured till the publication of *Vanity Fair*, not a year passed without his contributing to the magazines—in addition to a great mass of journalism—work the quality of which is not now disputed. In 1840 appeared his first book, *The Paris Sketch-book*, a series of reprints, followed in 1841 by the *Comic Tales and Sketches*, which contained the *Yellowplush Papers* from *Fraser*, *Major Gahagan* from the *New Monthly*, and the *Bedford Row Conspiracy*. These publications were a failure. In the same year the *Hoggarty Diamond* and the *Shabby Genteel Story* appeared in *Fraser*, followed by *Barry Lyndon* and *Men's Wives* in the same magazine. In 1843 and 1846 appeared respectively the *Irish Sketch-book* and *Cornhill to Cairo*. 'I can suit the magazines,' he wrote to a friend, 'but I can't hit the public, be hanged to them.' However, the magazines, and more especially *Punch*, the staff of which he joined in 1842 both as writer and drawer of pictures, enabled him in 1846 to set up house again; and he brought his family over from Paris to Young Street, Kensington Square. He was installed in this new home when the publication of *Vanity Fair* began, in monthly numbers, early in 1847; at which time he was also bringing out the *Snob Papers* in *Punch*. *Vanity Fair* was not at first a success. The earlier numbers failed to attract attention, and there was even a talk of stopping the publication altogether. Towards the end of the year, however, luck changed. Thackeray himself used to say that it was the success of the first of his Christmas books, *Mrs Perkins's Ball*, which made him fashionable. But, whatever the cause, there was no doubt about the fact. Every month the sale increased, and by the time *Vanity Fair* was finished it had made the author's reputation. Thackeray was no longer the servant, but the master of the public.

Vanity Fair had two results for Thackeray—the first, that he became a lion of society, and for some years enjoyed or endured the consequences of his position; the second, that he had no longer to look to *Punch* and the magazines for bread. The last number of *Vanity Fair* appeared in July 1848. It was followed in November of the same year by the first instalment of *Pendennis*. *Pendennis* was followed by *Esmond*, which was published in three volumes in 1852; and Thackeray then sailed for America with his lectures on the humorists, which he had already delivered with great success in London. On his return in 1853 *The Newcomes* began to appear; and on its conclusion in 1855, after the publication of *The Rose and the Ring*, which was begun at Rome for the amusement of his children, Thackeray again made a journey to America with his lectures on the 'Four Georges.' In 1857 he tried to get into parliament, standing for the city of Oxford as a Radical against Mr Cardwell, but was defeated by a majority of seventy-three. During this year and the next the *Virginians* came out. On the 1st January 1860 the *Cornhill Magazine* made its appearance, with Thackeray as editor. To the *Cornhill* he contributed *Lovel the Widower* and *Philip*, which seem to have been written somewhat against the grain, though *Philip* is specially interesting for the autobiographical element which it contains. But if the *Cornhill* did not bring out Thackeray's best work as a novelist, it furnished the occasion for the *Roundabout Papers*, the desultory form of which was a source of strength, not of weakness, and showed his powers at their best. In 1862 he gave up the editorship of the *Cornhill*, not being equal to the task of refusing manuscripts; but he continued to work for the magazine, and in that year he moved into a new house which he had built on Palace Green, Kensington. He always had a taste for bric-a-brac, which was not so fashionable then as now; and this house was the first built in London in red brick, in the style of Queen Anne, which has since taken such developments throughout the country. Here he began to write *Denis Duval*, which, so far as he had completed it when he died, promised to be as great as anything he had done. But his health, which had practically been broken by a fever caught in Rome in 1855, was bad. No immediate danger was feared, but he was found dead in his bed on the morning of Christmas Eve, 1863. He was buried in Kensal Green. His bust is in Westminster Abbey, in Poets' Corner.

The best commentary on Thackeray's books is furnished by the story of his life, as will be seen, it is hoped, even from the short account we have given. The qualities of his work speak for themselves to the least experienced of those who read him, and little need be said by way of exposition. It may be worth while, however, to point out that as an artist he is unsurpassed by any novelist, either in style or in his powers of description and of character drawing, or in the crowning gift of telling a story. His ideal of the novel was, like Fielding's, that it should be not an affair of plot or a form of idyll, but a prose epic; and if this ideal has ever been approached it is surely in *Vanity Fair* and *The Newcomes*. In the second place, it is worth dwelling for a moment on Thackeray's extraordinary sense of fun. So much of his humour is tinged with irony that readers sometimes fail to observe what sources of natural laughter are in his books, and what an unrivalled exhibition they give of purely comic power. Lastly, a word must be said about his satire. There will always be a class to whom Thackeray must appear as attacking the very essence of human society and turning to ridicule its most useful and ornamental members. Critics of this school can naturally never forgive him or sympathise with his genius. There is another class which takes a different view, and considers that what Thackeray calls 'snobbishness' is neither an essential nor a necessary part of human nature. Which of these two opinions may be correct it is impossible to prove; but if one turns from what Thackeray ridiculed to what he admired, it must be admitted that for a satirist his views of life are strangely sentimental. No one, it is safe to assume, ever read *Vanity Fair* without preferring Rawdon Crawley to his brother Pitt. But if those who think the *Book of Snobs* unjust will consider the reasons for this preference, they will understand why Thackeray disliked some things and why he cared for others.

No authorised biography of Thackeray has ever been published. There is a good short Life in the 'Great Writers' series (1891), by Herman Merivale and F. T. Marzials. In 1899 Lewis Melville published a Life in two volumes. Some of his letters were published in *Scribner's Magazine* (1887). Many of his drawings may be found in *The Orphan of Pimlico* (1875). The best portraits of him are by Samuel Lawrence; there was also a vigorous statuette by Boehm. See also Lady Richmond Ritchie's *Chapters from Some Memoirs* (1894) and her introduction to the *Biographical Edition* of the works (13 vols. 1898–99; and the *Centenary Biographical Edition* (1910); Eyre Crowe, *Thackeray's Haunts and Homes* (1897); Sir W. W. Hunter, *The Thackerays in India* (1897); Whibley's study (1903); and another Life by Lewis Melville (1910).

His eldest daughter, ANNE ISABELLA (1837–1919), born in London, passed her childhood in Paris, her girlhood at Kensington, and first appeared as an author in vol. i. of the *Cornhill* (1860) with 'Little Scholars.' To this sketch succeeded a dozen or more volumes of novels, tales, biographical essays, &c., of which may be mentioned *The Story of Elizabeth* (1863), *The Village on the Cliff* (1867), *Old Kensington* (1873), *Miss Angel* (1875, its heroine Angelica Kauffmann), *Mrs Dymond* (1885), *Chapters from Some Memoirs* (1894) and *Blackstick Papers* (1908). She wrote introductions to *Cranford*, *Our Village*, and the fairy tales of Mme. d'Aulnoy; a book on *Tennyson and his Friends: Portraits and Reminiscences;* and edited her father's works with biographical introductions. *Letters*, selected and edited by her daughter Hester Ritchie, appeared in 1924. In 1877 she married her cousin, afterwards Sir Richmond Thackeray Ritchie, K.C.B. (1854–1912), permanent under-secretary of state in the India Office, who wrote the preceding article on his father-in-law.

Thais, an Athenian courtesan, famous for her wit and beauty, who was in Asia with Alexander the Great, and according to Cleitarchus—a doubtful authority—induced him, when flushed with wine, to fire the palace of Persepolis (q.v.). After his death she had several children by Ptolemy Lagi.

Thalberg, SIGISMOND (1812–71), Austrian pianist, born at Geneva, a natural son of Prince Dietrichstein and Baroness Wetzlar, was intended for a diplomatic career, but made his début as pianist at the age of fourteen. He was made court pianist at Vienna, toured in Europe, Brazil, and the United States, and settled down in 1871 at Naples, where he died. He married a daughter of Lablache. As a pianist, in graceful and brilliant execution and in manual dexterity, he had scarcely a rival. It is said that the under tips of his fingers were 'real little cushions,' which were used with such effect in producing wonderful legatos that Liszt once made the remark: 'Thalberg is the only artist who can play the violin on the keyboard.' His compositions are of no value.

Thale, a pleasure and health resort of Saxony, on the river Bode, 7½ miles by rail SW. of Quedlin-

burg. The town is near several points of interest in the Harz district, and has saline springs, some manufactures, and an old foundry (16th century). Pop. 14,000.

Thales, an early Greek philosopher, born in 640 B.C. probably at Miletus in Asia Minor, was the founder of the Ionic or physical school of philosophy, and a pioneer of Greek geometry and astronomy. His profound knowledge gained him celebrity as one of the Seven Wise Men. He is said to have recommended the Ionians, who were menaced by the Persians, to form a federation against their powerful enemy, and to select Teos as the capital, and later we are told he induced the Milesians to withdraw from a union with Crœsus against Cyrus. He is also said to have predicted the eclipse of the sun which happened during a battle between the Medes and Lydians about the year 585 B.C.; and numerous other astronomical discoveries are attributed to him. Plutarch and others say that Thales was a trader, a calling which accounts for his reported visits to Egypt. He appears to have gleaned from the Egyptian priests his first knowledge of geometry, but he developed it in such a way as to be himself called the founder of line geometry. To him are credited the propositions that the angles at the base of an isosceles triangle are equal, that the angle in a semicircle is a right-angle, that a circle is bisected by its diameter, and several others of importance. Thales is also regarded by some as the first Greek that speculated on the constitution of the universe. According to him the original principle of all things is water, from which everything proceeds, and into which everything is again resolved. In connection with this doctrine he had, it seems, some idea of a soul or force in water productive of all the phenomena we see.

Thali'a. See MUSES.

Thalictrum, a north temperate genus of Ranunculaceæ with rue-like leaves and small sometimes wind-pollinated flowers without petals. British species include *T. flavum*, the common meadow-rue.

Thallium (sym. Tl; atom. number 81; atom. wt. 204·1) is a metal which derives its name from Gr. *thallos*, 'green,' because its existence was first recognised by an intense green line appearing in the spectrum of a flame in which thallium is volatilised. It was discovered by Crookes in 1861 in the seleniferous deposit of a lead chamber of a sulphuric-acid factory in the Harz Mountains; and it was soon obtained in large quantities by M. Lamy. Thallium is slightly heavier than lead—a metal which it resembles in its physical properties. It is very soft, being readily cut with a knife or drawn into wire; and its freshly-cut surface exhibits a brilliant metallic lustre and grayish colour, somewhat between those of silver and lead. In contact with the air it tarnishes more rapidly than lead, and becomes coated with a thin layer of oxide which preserves the rest of the metal. It fuses at 554° (290° C.), and at a red heat becomes volatilised. The metal and its compounds give a bright green tint to colourless flames; the spectrum of thallium is marked by a single sharply-defined green line. It is used to produce a green light in firework displays, and is employed to render glass highly refractive. The metal can best be preserved free from oxidation by being covered with paraffin and kept below water. Thallium forms a number of compounds, including three oxides.

Thallophyta. See VEGETABLE KINGDOM, ALGÆ, SEAWEEDS, FUNGI, &c.

Thallus, a vegetative body showing little or no differentiation into leaf, stem, and root, and characteristic of the *Thallophytes* or lower Cryptogamia. Even in the higher members of the ascending series the thallus has neither true vessels nor woody tissue.

Thames, the most important river of Great Britain, flows east-south-east across the south portion of the country. Its four head-streams—the Thames or Isis, Churn, Coln, and Leach—rise on the south-east slope of the Cotswold Hills, the upper part of the main stream being often called Isis (a quasi-classical form of *Ouse*), especially in the neighbourhood of Oxford. The Thames or Isis flows east-north-east for about 35 miles, when, curving south-east, it passes Oxford, and flows on to Reading, where, after receiving the Kennet from the west, it again changes its course; and with a generally eastward course it passes Windsor, Eton, Teddington (the lowest of some forty locks from here to Lechlade, and the highest point to which the tide ascends), Richmond, London, and Gravesend, a few miles below which it expands into a wide estuary, and enters the North Sea. On its tidal estuary, and on the fact that like most British rivers it has no delta, depends the river's importance as a navigable waterway; the navigation is, however, somewhat impeded by what has been called a 'submarine delta'—banks formed of river sediment. From Lechlade to the Nore the direct length is 120 miles, and with the windings is about 210 miles (112 from Oxford to London Bridge); the area of its basin is about 6000 sq. m. Throughout the greater part of its course it forms the boundary-line between several of the southern counties. Passing Cricklade, it forms part of the northern boundary of Wilts, and below this point it separates the counties of Oxford, Buckingham, Middlesex, and Essex on the north from those of Berks, Surrey, and Kent on the south, but cuts across the county of London. Its chief affluents are the Windrush, Cherwell, Thame, Colne, Lea, and Roding, on the left; and the Kennet, Loddon, Darent, Mole, Wandle, and Medway, on the right bank. At London Bridge the width of the river is about 290 yards; at Woolwich, 490 yards; at Gravesend Pier, 800 yards; three miles below Gravesend, 1290 yards; and at its mouth, between Whitstable and Foulness Point, about 8 miles below the Nore, it is 18 miles across. At the Nore Light, the commonly reputed mouth of the Thames, the breadth is nearly 6 miles. The river is navigable for barges to Lechlade, and it is connected with several important canals, by means of which it maintains communication with the west and south coasts, and with the interior of the country. Vessels drawing 20 feet can reach St Katharine's Docks; much larger ones can ascend to Blackwall, 6 miles below London Bridge; and the largest sea-going steamers reach Tilbury Docks, 26 miles below. The part of the river in the immediate vicinity of London Bridge is called the *Pool;* and the part between the Bridge and Blackwall is called the *Port*. Two embankments have been formed, one since 1864 on the north shore from Blackfriars Bridge to Westminster, and one since 1866 on the south shore from Westminster Bridge to Vauxhall. Some of the great bridges which span the river at London are described at BRIDGE.

The Thames was given to the Lord Mayor of London in 1489, but for long commerce was greatly hindered by the existence of locks and weirs set up by individuals. In the 18th century the river administration was placed under commissioners. In 1857 the Thames Conservancy Board was established (see LONDON), but the Port of London Act (1908) put the administration of the river below Teddington in the hands of the Port of London Authority. Private companies owned the various wharves, docks, and quays until 1909, when they were bought up by the government. The port extends for 70 miles of the Thames, and the quays for 33. Above London the scenery is rich and beautiful, though not romantic, the numerous

islands or eyots lending a peculiar charm. The Thames is the best beloved of English rivers for those who boat for pleasure. It is the centre of boat-racing in England (see ROWING); the Thames watermen are renowned in song and story. Since Spenser's days 'the silver-streaming Thames' has been sung by England's poets; Herrick calls it 'Silver-footed Thamesis'; Denham's apostrophe has long been famous; and Pope has gracefully word-painted much of the scenery of its banks. It was (now alas! long since) famous for its salmon, as it still is for other anglers' fish; below London flounders and eels are still plentiful, while the young herrings and sprats, known as whitebait, are characteristic of the lower Thames.

The Thames has a copious bibliography of its own, many of these works being richly illustrated. A few books worth consulting are those by Huxley (*Physiography*, 1877), George D. Leslie, R.A. (1881; new ed. 1888), Church (1885), Herring (1885), Cassell (*Royal River*, 1886), Justin McCarthy and Mrs Campbell Praed (1890), Senior (1890), Pennell (1891), Wyllie and Allen (1894), Charles Dickens, jun. (1880), Sir Walter Besant (1905), Jerrold (1906), Vincent (1909), Belloc (1907–13), F. S. Thacker (1909, 1914, 1920), W. Higgins (1923), F. V. Morley (1926).

Thames (or GRAHAMSTOWN), New Zealand, a gold-mining town of 6000 inhabitants, on an inlet of Hauraki Gulf, 40 miles SE. of Auckland.

Thamugas, or TIMGAD, 'the Numidian Pompeii,' near the Aures Mountains, and 22 miles from Batna, which is half-way by rail from Constantine to Biskra. Here are in the solitude extensive remains of colonnades, temples, a forum, a triumphal arch in honour of the Emperor Trajan (founder of the city), and numerous statues and inscriptions coming down to the 5th century, when the Roman city was destroyed by the barbarians.

Thana, or NORTH KONKAN (see KONKAN), a British district of India, consisting of the island of Salsette and a strip of coast. The chief town, Thana, a seaport, is 21 miles NE. of Bombay by rail.

Thane (O. E. *thegn*), a member of a class in the old English community that stood distinctly below the old nobility (*eorlas*, &c.), but above the mere landowners or *ceorls*. The word thegn seems to have meant first soldier, then attendant, servant of the king, royal official; and gradually the thanes came to constitute a kind of nobility of service as distinguished from nobility of blood. Finally, however, the ordinary thane was simply a landholder on a larger scale than the ceorl—one who had five hides or more of land—and the dignity was hereditary, the 'king's thane' being a superior class. The thanes nearly corresponded to the Norman knights; and after the conquest they were mostly absorbed into the knighthood. After the reign of Henry II. the name of thane fell into disuse in England. In Scotland, on the other hand, where the title is occasionally used as late as the 15th century, the thane was a hereditary non-military tenant of the crown; and there is no foundation for the notion derived by Shakespeare from Boece, that the Scottish thanes all became earls.

Thanet, ISLE OF, forms the north-eastern corner of the county of Kent, from the mainland of which it is cut off on the western side by the river Stour and the Nethergong rivulet—the ancient Wantsome channel, completely silted up since the beginning of the 16th century. It is bounded on the N. and E. by the sea, and opens on the south side into Pegwell Bay. It measures 10 miles east and west, and about 4 miles north and south, and contains 26,117 acres. On the shores of the island are the well-known watering-places, Ramsgate, Margate, and Broadstairs; and on the North Foreland, in the north-east, there is a lighthouse. Pop. (1871) 42,129; (1881) 50,646; (1921) 112,597. It is a parliamentary division.

Thanet Sands. See EOCENE SYSTEM.

Thanksgiving Day, in the United States, is an annual festival of thanksgiving for the mercies of the closing year. Practically it is a national harvest festival, fixed by proclamation of the president and the governors of states, and ranks as a legal holiday. In 1789 the Episcopal Church formally recognised the civil government's authority to appoint such a feast, and in 1888 the Roman Catholic Church also decided to honour a festival which had long been nearly universally observed—though nowhere with such zest as in the New England states, where it ranks as the great annual *family* festival, taking the place which in England is accorded to Christmas. The earliest harvest thanksgiving in America was kept by the Pilgrim Fathers at Plymouth in 1621, and was repeated often during that and the ensuing century; congress recommended days of thanksgiving annually during the revolution, and in 1784 for the return of peace—as did President Madison in 1815. Washington appointed such a day in 1789 after the adoption of the constitution, and in 1795 for the general benefits and welfare of the nation. Since 1817 the festival has been observed annually in New York, and since 1863 the presidents have generally issued proclamations appointing the last Thursday of November as Thanksgiving Day.

Thann, a town of Alsace-Lorraine (department Haut-Rhin), 13 miles NW. of Mühlhausen by rail. It contains a superb Gothic church (1516) surmounted by a spire of delicate open work, upwards of 300 feet high; and near-by are the ruins of the feudal castle of Engelburg. Cotton cloths, silks, chemicals, and machinery are manufactured. The town was taken by the French in August 1914. Pop. 7400.

Tharandt, a picturesque town of Saxony, 9 miles SW. of Dresden, is a favourite resort, and has an old and famous forestry school.

Tharsis. See TARSHISH; and for the modern Tharsis copper-mines, see RÍO TINTO.

Thasos, an island in the northern Ægean Sea, off the coast of Macedonia, was famed of old for its gold mines, its marble quarries, and its timber. The mines and quarries are no longer worked. The surface is covered with wooded hills (the summit of Hypsaria being 3428 feet high), and though the timber resources are not exploited as they might be, there is an export of charcoal and some boat-building. Oil and honey are also produced. The population, mostly Greek, is about 15,000, distributed in some eleven villages, besides hamlets and scattered huts. Thasos was colonised by the Phœnicians, then by the Greeks (*c.* 700 B.C.). It fell to the Persians in 492 B.C., and later was subject in turn to Athens, Sparta, Macedon, and Rome. The Venetians took it in 1204, and the Turks in 1462. From 1841 the Khedive of Egypt held sway, but the Turks reaffirmed their possession in 1908. Greece obtained the island by the Treaty of Bucharest (1914).

Thaumatrope. See ZOETROPE.

Thayetmyo, a district in the Magwe division of Upper Burma; area, 4750 sq. m.; pop. (1921) 255,406. The chief towns are Thayetmyo (10,768) and Allanmyo (11,219).

Thea, Theaceæ. See TEA, TERNSTROEMIACEÆ.

Theatines, a religious brotherhood of the Roman Catholic Church, which played a very important part in the internal movement for reformation which took place in Central and Southern

Italy towards the middle of the 16th century. The founders of this association were a party of friends, Cajetan di Thiene, John Peter Caraffa, at that time Bishop of Theate (from which the Congregation took the name *Theatine*), Paul Consiglieri, and Bonifazio di Colle. Cajetan and Caraffa, in concert with the two other friends named above, having resigned all their preferments, obtained in 1524 a brief of Clement, formally constituting the new brotherhood, with the three usual vows, and with the privilege of electing their superior, who was to hold office for three years. They were forbidden to possess property, and were to subsist entirely upon the alms of the faithful; and yet they were strictly forbidden to beg, or in any way to solicit charitable contributions. Their first convent was opened in Rome, and Caraffa, afterwards Pope Paul IV., was chosen as the first superior. He was succeeded in 1527 by Cajetan, and the Congregation began to extend over Italy, and afterwards into Spain, Poland, Germany, not reaching France till 1644. To their activity, devotedness, and zeal Ranke ascribes much of the success of that remarkable reaction against Protestantism which took place in the later half of the 16th century. The Theatines were also active as missionaries in distant lands such as Peru, East Indies, &c. The order declined greatly during the 19th century. Bodies of Theatine nuns were founded in 1583 and 1617 by Ursula Benincasa.

Theatre (from the Greek *θέατρον*, 'a place for seeing,' *θεάομαι*, 'I see'), a name given to that portion of the building in the enclosure sacred to Dionysus Eleuthereus in which the spectators sat in contemplating the lyrico-dramatic spectacles evolved from the ancient rites of the god. It is now given to any building constructed to exhibit drama or other spectacle. The designation 'lecture-theatre' is given to a place built for university demonstrations in which sight as well as hearing is given full consideration. A room constructed for surgical work with a special view to sight is called an 'operating theatre.' This article treats only of the theatre as the home of the drama.

Since the beginning of the present century the study of the relationship of the place to the play, including all their modifications down the ages, has been attracting a growing number of scholars. By a gathering together of additional enlightening records and by a more scientific interpretation of the collected facts than was formerly made, the continuity of theatric history is becoming apparent. It was thought during the 19th century that the Elizabethan theatre immortalised by Shakespeare was 'a theatre without precedent,' but a gathering chain of evidence shows the great extent of the classical forces which reached England in early Tudor times. Many points which were interpreted as showing puerility of Elizabethan scenic method, in the light of recent discovery and insight into the inherent nature of this form of human expression, are seen to be in line with the highest tradition of the most ancient theatre, to the living principles of which a return may yet be made. The Greek theatre is the prototype from which all European theatres are derived. This being so, it is one of the most interesting buildings in the world.

Discoveries made in Crete since 1900 have revealed, after centuries of oblivion, far more ancient places of spectacle than those of Greece, from which the modern theatre was more or less consciously derived. The oldest is at Phaistos, in the palace, the building of which is placed at *c.* 2200–2100 B.C. A terrace, cut in the slope of the hill on which the palace stands, has beyond it a flight of steps about 60 feet in length which lead nowhere, and are therefore presumed to have been constructed to accommodate people in order that they might watch spectacles in the area below. The Homeric songs, which are held to depict a civilisation in transition from the Bronze to the Iron Age, make reference to a figured dance,

> Such once was seen
> In lofty Cnossus for the Cretan queen
> Form'd by Daedalean art.
> (*Iliad*, Book xviii.)

The excavations at Cnossus have brought to light the palace of Minos and, around the queen's chief apartment, a dado of dancing girls. Abutting on to the highway to the sea is a paved space of about 40 feet by 30 feet. On two sides of this are tiers of steps joining at a right angle. A small adaptation of this design has been found at Gournia.

The golden age of Crete is placed at *c.* 1500–1450 B.C. Its culture spread to Greece, and its own power passed away, whilst the splendour that had been was enshrined in Greek art. Scenes depicted on gems and rings found in Crete show priestesses dancing in a circle around the shrine of the Earth-Mother. The Eleusinian Mysteries in honour of Demeter, held in Greek temples long prior to the foundation of the theatre at Athens, included as part of the initiation of the worshippers a sacred representation of a dramatic nature. See MYSTERIES.

The Classic Theatre.—The Dionysian rites from which the Greek drama grew were communal festivals of Asiatic origin in time immemorial. In essence they were passionate expressions of the national desire for fertility and thanksgiving for the blessings of the god. They were celebrated at the time of the gathering of the grape, again at its pressing, and on the first drawing of the new wine with its tasting, and lastly in a great festival held at the end of the month of March, known as the *Great Dionysia of the City*. The celebrations required a large open space, to which a procession was made by the whole community, who there performed ritual movements around a central altar, or *thymelē*. The name *orchēsis* was given to the actions. This word is translated by 'dancing,' as being the nearest term, but it signified much more than the modern application generally includes. In ancient times dancing included the whole symbolism of bodily movement and attitude. References made to it by classical writers show that the arm and hand movements were even more studied than those of the feet, and the performers had power to reveal thought and feeling by an appreciable principle of correspondence. The circular space around the altar gained the title *orchēstra*, as being the ground of the orchesis. The god Dionysus was represented by an image presiding over the altar. The poet Arion is credited by tradition with giving a measured form to the improvised song and orgiastic dithyramb or 'revel of the god' (*c.* 600 B.C.). Arion was a worshipper of Apollo, the 'Shaper,' the god of Order. The number of performers was now limited to a *chorus* of fifty men and boys, whom the rest of the community deputed to represent them while they became onlookers. In the city of Sicyon the chorus celebrated the character of Adrastus, the type of unavoidable suffering, who was but Dionysus under another mask or aspect. The dramatic poet Epigenes of Sicyon was followed by a succession of leaders of the chorus until Thespis, who is credited with the introduction of dialogue between himself as chief, or *hypokritēs*, 'one who answers,' and the rest, for the sake of variety and alternating some repose with the evolutions of the dance. It seems that, in B.C. 535, at the bidding of Pisistratus the ruler of Athens, Thespis united the Dionysian song and dance with the Apollonian rhapsodical recitation hitherto cultivated, par-

ticularly in Ionia. This amalgamation appears to have taken place in the orchestra within the enclosure sacred to Dionysus Eleuthereus at the foot of the Acropolis or Upper City. The remains of a circular dancing-place belonging to the 6th century B.C., and of successive theatres built on approximately the same site, have been excavated here.

Thespis as first actor, or *protagonist*, represented an imaginative figure of the god whose mask he wore, and in addressing the chorus he was elevated on to a narrow stage beyond the altar and facing the spectators. The community in this way was now differentiated into the chorus of dancers and singers in the circular orchestra, the contemplators in the theatre, and the imaginative figure on the stage. The state recognised the national passion and genius for dramatic art and proceeded to establish a great organisation of dramatic contests. Æschylus (524–456) introduced a second actor, the *deuteragonist*; a third, the *tritagonist*, was introduced by Sophocles (496–406). In the hands of these two supreme theatric artists dramatic expression reached its greatest height. The art of the theatre was a plastic projection of the drama as conceived in the minds of the dramatists. They did not begin by conceiving dialogue, but by conceiving a sequence of situations as between man and his destiny. The execution of the drama thus conceived required first the symbols of the place in which the imaginary *agōn* or contest was to be worked out

The Skēnē.—The stage was enlarged to a width equal to one diameter of the orchestra, approximately 65 feet. Passages, or *parodoi*, were left at either end between it and the seats of the spectators. By a convention growing out of the position of the Athenian theatre, that on the right led supposedly to or from the neighbourhood, that on the left, to or from a distance. The parodoi were used by the chorus and sometimes by the actors. Behind the stage, buildings were elaborated from the *skēnē*, or 'covering made by art,' which was the first actor's booth or dressing-room. The façade, which in time

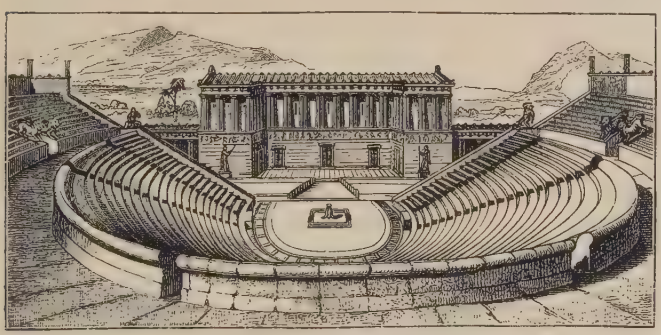


Fig. 1.—Theatre at Segesta, restored.

came to have a projecting wing, or *paraskēnia*, at either end, formed the background against which the drama was enacted. It derived the name *skēnē* from that previously given to the whole stage building. The stage was sometimes called the *logeion*, or speaking-place, and sometimes the *proskēnion*, from its position in front of the *skēnē*. The locale of the early plays was before a temple or royal palace. The architectural *skēnē* was built to symbolise such a place. The text of the plays and other evidences indicate that there were double doors in the centre and others at either side. An upper story was required with a platform or balcony, the *distegia*, on which the actor might appear and obtain a distant view, as in the case of the watchman on the look-out for the beacon signals in the opening of the *Agamemnon*. The ever-growing need of the dramatists for freedom in imagination expressed itself in an ever-growing ingenuity and experiment. According to Aristotle, perspective scene-painting was introduced by Sophocles.

Vitruvius, in his *Architectura* (written during the reign of Augustus), said: 'In the first place Agatharchus, in Athens, when Æschylus was bringing out a tragedy, painted a scene and left a commentary about it. This led Democritus and Anaxagoras to write on the same subject, showing how, given a centre in a definite place, the lines should naturally correspond with due regard to the point of sight and the divergence of the visual rays, so that by this deception a faithful representation of the appearance of buildings might be given in painted scenery, and so that, though all is drawn on a vertical flat façade, some parts may seem to be withdrawing into the background, and others to be standing out in front.'

Scenography was thus anciently regarded as a serious and not a trivial matter. In describing the ancient theatre Vitruvius said: 'The *scaena* itself presents the following scheme. In the centre are double doors decorated like those of a royal palace. At the right and left are the doors of the *hospitalia*. *Secundum* are spaces provided for decoration places that the Greek call περίακτοι, because in these places are triangular pieces of machinery which revolve, each having three decorated faces. When the play is to be changed, or when the gods enter to the accompaniment of sudden claps of thunder, these may be revolved and present a face differently decorated. Beyond these places are the projecting wings which afford entrances to the stage, one from the forum, the other from abroad.'

The meaning of this passage has been endlessly disputed, chiefly owing to the difficulty of determining the sense in which the word '*secundum*' is used in introducing the description of the *periaktoi*. Notable renaissance architects and scenographers understood it to mean *beyond*, the required faces of the triangular prisms being viewed through the open doors. Others have assumed that the periaktoi were used in front of the scenic wall. The allusion to their use in connection with the entrance of the gods has been interpreted as meaning that the entrance was effected by their use, a ledge in one face accommodating the figure which was turned into sight. This interpretation confuses the periaktoi with another machine. Their use in conjunction with the entrance of the gods may have been to produce a *transformation* as a fitting accompaniment to the wonder.

Servius, in his commentary on the *Georgics* of Virgil, written in the 4th century A.D., records, as an alternative to the periaktos or *scaena versilis*, the *scaena ductilis* which could be withdrawn to display the next required species of decoration. At what date either of these first came into use is not known. One grammarian mentions the periaktoi among a list of appliances which might be ascribed to Æschylus.

With the advance of scenography three types of scene were evolved for tragedy, comedy, and satyr play which were performed in a sequence in one day. Vitruvius wrote: 'There are three types of scenes, one called the tragic, second the comic, third the satyric. Their decorations are different and unlike each other in scheme. Tragic scenes are

delineated with columns, pediments, statues, and other objects suited to kings; comic scenes exhibit private dwellings, with balconies and views representing rows of windows, after the manner of ordinary dwellings; satyric scenes are decorated with trees, caverns, mountains, and other rustic objects delineated in landscape style.'

Lines in the *Georgics* (iii. 24–25) of Virgil indicate that the poet was familiar with the sight of an *aulaeum*, a front screen which rose from below instead of being fixed above, as are the curtains of to-day.

Machines.—Vitruvius, besides describing the triangular prisms and the changes of scene effected by them, describes other machines. He shows that it was regarded as the duty of the rulers to provide them. Pollux, the Greek grammarian of the 2d century A.D., in his *Onomasticon*, also gives a list and description. When it was desired to show an interior scene, an inner stage was brought forward into the line of sight. This was known as the *ekkyklēma*. Pollux says that this device was used in tragedy, while the *exōstra* was used in comedy. The imagination of the great dramatists saw visions of gods driving through the air in chariots. Æschylus imagined Oceanus descending on a 'winged quadruped,' or the body of Memnon carried by the Dawn into the sky. Being a dramatic artist, and not merely a descriptive poet, he recognised that he must show these visions, not describe them. And so a powerful crane was placed in the western corner, the left, of the stage at the very top of the back-scene. By its means gods or heroes could pass from earth to heaven, or from heaven to earth, or hang suspended midway. This machine was so important that it became known as *the* machine, the *mēchanē*. The term *deus ex machina*, 'the god out of the machine,' soon became proverbial. The dramatists felt also that there is a correspondence between disorder in the elements, 'civil strife in heaven,' and disorder in human relationships. Thunder and lightning are to them direct symbols of divine power and wrath. It became immediately necessary to represent these symbols. So the *keraunoskopeion* signified flashes of lightning (by prismatic mirrors or other means) and the *bronteion* thundered. A flight of steps, known as Charon's steps, enabled ghosts to ascend from below on to the stage. Other machines, in the nature of trap-doors, give access to the Furies, river gods, and any subterranean beings. The dramatists sometimes wished to show the gods presiding in celestial splendour over human destiny. These then appeared on the *theologeion*, the gods' speaking-place, high in the back-scene. Aristophanes needed such devices for his comedies just as much as did the tragic poets for their serious work. Early writers merely record their use and designations, for the most part without comment, accepting them as a matter of course. But late commentators have enlarged upon their mechanical aspect in an apologetic manner, liable to prejudice the reader, forgetful of the fact that they were introduced by dramatic artists who produced greater effect than has ever since been witnessed. The machinery of the most advanced theatres of to-day is still a matter of pulleys, wheels, and grooves. It is only the dramatic aspect that the true play-goer criticises. Modern science has improved the mechanical power, and there has been an increase in elaboration and expense, but in principle these scenes and machines remain what they were. Their reconstruction was a matter of the deepest interest to all the great theatrical artists of the Renaissance, because a reaction between actor and scene is inherent in the nature of drama, and the poetic play requires the variety they were originally designed to effect.

The Athenian theatre gradually attained some permanence of form, and the first wooden structure was replaced by one of stone. Lycurgus interested himself in improving the building in the 4th century. 'A Greek town could hardly be so small as not to have its own theatre and dramatic festival.' The most beautiful structure was that at Epidaurus. Others of great interest are found at Eretria, Tyndaris, Delos, Sicyon, and Segesta.

The Performers.—The performances were treated as divine observances in honour of the god, and the performers had civil privileges as ministers consecrated to the service of religion. The world represented in the drama was an ideal world, differentiated from the natural world. The spectator saw projected on to the stage, not a human actor but the image, male or female, the mask, which the dramatist designed. Æschylus devoted study to these dramatic masks, which in his hands had considerable power of expression, and were designed to define and carry over the vast expanse of the theatre. Their use as a cover to the natural countenance of the actor left no room for doubt as to the imaginative nature of the art. The expression of the mask varied with the variety of the play of light and shadow and as the angle of the head changed, and thus it appeared alive with the life of art. The tragic actor was given height by the *cothurnus*, a boot of special design, and by the *onkos*, a head-piece worn above the mask, while his rich ideal costume suitably enlarged the appearance of his body. There was no thought of being 'just like life,' but every endeavour was made to realise the figures of imagination by emphasising certain aspects of nature. The Apollonian rhapsodical part of the drama was the portion of the actors. Sustained dramatic attitude and gradual transition was required. Their voices were the finest the country could produce. The members of the chorus were distinct from the actors, and preserved the Dionysian traditions. Their dances were of three kinds, appropriate to the tragic, the comedic, or the satyric play. Their masks and costumes were similarly of the three types. The mere appearance of the Furies, in a tragic chorus as designed by Æschylus, inspired terror in the beholders. The satyric chorus portrayed men as half-goat and half-human. The comic chorus was of a most varied and fanciful range of disguise as clouds, seasons, towns, islands; mythological beings, as Amazons, sphinxes, sirens; or animals, birds, fish, and insects, as dolphins, vultures, frogs, ants, bees. These were not represented with what is called realism, but with the selective genius of visual artists. The chorus formed a bridge, as it were, between the ideal beings on the stage and the spectators, who not so long before had been one with them. The prizes in the contests were awarded on the totality of impression, not on the work judged as literature. The playwright supervised the whole, and himself taught the actors their parts. They were paid high wages by the state. Some rich men, the *chorēgoi*, deemed it an honour to be responsible for provision of the chorus. Preparations extended over the year.

Æschylus was his own protagonist in the earlier part of his career. When he retired to direct the productions only, Cleander became his first actor. When he introduced a second actor, the part was fulfilled by Myniscus. Sophocles sometimes appeared, on one occasion as a harpist and on another as leader in a ball game in which he showed great skill. Cleidemides and Tlepolemus are referred to as actors of Sophocles. Nicostratus delivered long narrative speeches so well that to 'do a thing like Nicostratus' became proverbial for excellence of execution. The tragic actor Polus

of Aegina is said to have taught Demosthenes the art of delivery. About the middle of the 5th century, names of actors appeared in the official lists of the victors in the contests side by side with those of the poets and the *chorēgoi*. The foremost actors were the friends and sometimes the ambassadors of monarchs. In the course of the 4th century the poets, actors, chorus-singers, dancers, trainers, and musicians formed a guild. Its members were called *The Artists of Dionysus*.

The Decline of the Classic Stage.—The rise of sophistry in Athens caused the dramatists, led by the powerful genius of Euripides (*c.* 480–406), to change from inspirational artists into rationalists. The interest of the performance deserted the dancers in the orchestra, and became more and more centred on the dialectics conducted amongst the characters on the stage. These characters lost their divinity, and represented only the double of the citizen. This was anciently regarded as a decline or an advance accordingly as the sympathies were with the ancestral wisdom or the 'new thought,' and it is still so to-day. There can be no two opinions about the loss of power caused by the division. The significance of the chorus was reduced until it formed merely a musical link between the parts of the action. An alteration in structure accompanied the change of conception. The later stages were deepened and raised. The chorus, now representing human beings as sophists, poets, sorcerers, athletes, tradespeople, Persians, Thracians, Macedonians, and so on, was transferred to the stage or disappeared. At the end of the 3d century the orchestra was made watertight, and nautical episodes enacted therein. All along the theatre had been put to other uses besides that of showing the drama. With the fall of Athens and the rise of Roman domination further changes were made. In the Græco-Roman theatre, when the orchestra was not required for the spectacle, distinguished spectators were given seats therein, and the stage was lowered for their benefit. In the theatres which the Romans themselves now built, the typical orchestra formed approximately a semicircle. The scenic façade became a grand and ornate structure, while still retaining its essential features. A beautiful theatre on this model is found at Aspendos. Rome still preserves the ruins of the theatre of Marcellus, begun under Julius Cæsar, and finished by Augustus in 13 B.C., under the name of his nephew. Theatres have been excavated at Pompeii (q.v.), at Herculaneum (q.v.), at Verona, and more recently at Ostia, near Rome. Pliny records two temporary theatres which were made to revolve and form one amphitheatre when required. The finest specimen existing of a Roman theatre is at Orange, in the south of France. Sites of Roman amphitheatres can be seen in England at Dorchester, and other places. That at Caerleon is at present in process of excavation with the financial support of Lord Rothermere. The Romans gave the name *cavea* to the spectators' portion of the building. The orchestra was covered with sand for sporting events, and so derived the name of *arena*. The stage was sometimes called the *pulpitum*.

From holding a position of privilege and esteem, actors fell into disgrace, and by Roman law they were deprived of civil rights. Exception was made in the cases of Laberius and of Roscius in recognition of their genius. The name of Mæcenas, the patron of Bathyllus, a pantomimist, has long been proverbial as that of a lavish supporter of artists.

In the 1st century A.D. the stage-buildings of the Athenian Theatre were reconstructed. The façade was decorated with an inscription dedicating it to Nero. About two centuries later the stage was rebuilt by one Phædrus, this fact being commemorated in verse on one of the steps. During the dark ages the place was deserted, and the theatre gradually disappeared from view. Even the site was forgotten, not to be located until 1765, when it was pointed out by Chandler. Excavations were begun in 1862 by Strack, a German architect, and continued for three years. An effort was again made in 1877. Dr Dörpfeld, acting on behalf of the German Archæological Institute, directed further excavations in 1886, 1889, and 1895. *Das Griechishe Theater* by Dörpfeld and Reisch, giving an exhaustive account of the discoveries, was published in Athens in 1896.

The Christian Theatre.—Besides the drama, pantomimical shows, gorgeous ballets, acrobatics, gladiatorial contests, sword-swallowing, and such marvels were given, in the early Christian era, and exhibitions of an appalling licentiousness, until all spectacle ended with the downfall of the Empire. Many of the theatres were converted into fortresses. The scene of the next drama was within the Christian church. During the 6th century, and particularly under the rule of Pope Gregory the Great, rites and ceremonies of a dramatic nature were elaborated. Outside the church wandering players appeared on improvised stages. The mediæval guilds manifested dramatic enthusiasm. Sir E. K. Chambers, in *The Mediæval Stage*, quotes references to a theatre in Exeter as early as 1348. In 1402 the Brothers of the Passion set up a temporary stage in the great dormitory of the *Hôpital de la Trinité*, Paris. Records of mystery plays show that they were acted on many curious stages. A *multiple* scene, that is, one with a required number of settings shown simultaneously, either in a long parallelogram or built in two stories, was often used. The beautiful carved reredoses of the 15th century show the method of visualisation; so also do the Stations of the Cross. Two pictures by Hans Memlinc are derived from such performances. One of these is in the gallery at Turin, and one at the Pinakothek, Munich. A miniature painted by Jean Fouquet, showing the martyrdom of St Apollonia, as designed by him for a mystery play, is reproduced by Mantzius in his *History of Theatrical Art*. Ten rooms, or mansions as they were called, are shown built in two stories with a semicircular head-scene. Brunelleschi designed on classical lines for the church scene. A wide study of theatre construction recommences with the publication, in 1486, of the *De Architectura* of Vitruvius, hitherto known to a few only in manuscript. The edition was dedicated to Cardinal Raffaelle Riario, of the Roman Academy, the great patron of the revival of classical drama. An edition of the plays of Terence, published in 1493, has a woodcut showing the interior and exterior of a theatre, which appears to be octagonal in plan and to have three tiers of seats and boxes at the side of the proscenium, one of which is reserved for the municipal chiefs. The proscenium opening is provided with a hanging curtain and has three arches supported by pillars; two or three steps lead down from the inner stage to a forestage. A reproduction of the picture is given in *The Mask*, Vol. VI. By 1500 there were numerous academies in Italy devoted to the production of classical plays, and every ducal court had a hall temporarily or permanently converted into a theatre. George Vasari, in his *Lives of the Painters*, gives account of the study of perspective painting made by Baldassare Peruzzi from the earlier work of Piero dal Borgo. Peruzzi was also a student of Vitruvius. Bramante of Milan and Bramante of Urbino showed early interest in perspective. Leonardo da Vinci observed that 'Perspective is to painting what the bridle is to a horse.' The scenic production of drama with

perspective painting was taken as seriously as its oral production and accepted as an essential. Sir E. K. Chambers, in *The Mediæval Stage*, mentions a theatre built in the Vatican by Alberti, about 1452, of which no performances are recorded. In 1513 Pope Julius II. called upon Michelangelo, Bramante of Urbino, one of the San Gallo family, and Raffaello to prepare a great festival. Flechig records a theatre built for this occasion. Engravings exist showing the Corte di Belvedere, in the Vatican, in form of a theatre. In 1514, on the death of Bramante, Raffaello was made General Superintendent of Fine Arts, in which position he was responsible for the building of theatres and for dramatic production. He caused a special translation of Vitruvius to be made. A performance of *La Calandria* by Cardinal Bibbiena was given at the court of Urbino in 1513, and again before the Pope in 1514. For this, Vasari records, Peruzzi 'made two such scenes as were marvellous, and opened the way to those who have since made them in our day.' Raffaello made a production, in 1515, in the Capitol, and, in 1518, the *Suppositi* of Ariosto and other plays were acted in the Castello di San Angelo with his scenic collaboration. Ariosto himself directed a theatre at Ferrara. The classic *aulaeum* was used at this time and remained in use, while curtains which rose or divided also came in. Theatres were built in the palace in Ferrara in 1528; in Mantua, by Bertani, in 1549; in Siena, by Riccio, in 1560.

A curious sketch belonging to about this period, made by Antonio San Gallo il Giovane, is preserved in the Uffizi Library. It shows the artist's interpretation of the scheme of the classic *scaena* as described by Vitruvius. He strangely places the periaktoi *inside* the wings at either end of the stage, though others understood Vitruvius to say that the projecting wings were *beyond* the periaktoi. Having so read the directions, apparently he is puzzled as to how the required face of the triangular prism was to be seen. He makes his prisms about half the height of the wings, in which he cuts windows to display the decoration called for. The drawing was reproduced for the first time in *The Mask*, Vol. XI. It illustrates the difficulty long made over the use of the periaktoi and the interest which their reconstruction, in reality a childishly simple matter once their position is agreed upon, evoked. The first edition of Vitruvius was followed by numerous editions, commentaries, and translations. In 1537 the *Architectura* of Sebastiano Serlio began to appear. The second book of this work, 1545, deals with perspective and in particular with scenography. Serlio was himself engaged in building temporary theatres in princely halls and academies, and gained a great reputation as a producer of spectacles. He based his practice on his study of Vitruvius and of his master Peruzzi. He regards stage works as 'things which stately and great persons doe, which are the enemies to niggardliness.' He conceives his scenes in the three types of tragic, comic, and satyric; he is unconcerned with questions as to the relationship of the scene to the drama, accepting this relationship as inherent. He directs that an inner and a forestage are to be built, the inner stage to be raised one-ninth of its depth above the other and to rise as it recedes—this for the better displaying of the scene. (Such a rise is to-day called a *rake*, borrowing the nautical word.) Serlio adapts the Vitruvian description of the triangular perspectives into a *built scene*, constructing frames of wood, covering them with canvas and painting them. Such 'houses' he carefully foreshortens according to rules of 'false perspective.' He gives directions for stage-lighting.

In 1556 Daniello Barbaro, a fellow student with Andrea Palladio, published an Italian translation of Vitruvius, which he followed with an edition of both the Latin and the Italian together, 1567. This was three times reissued. Barbaro understood Vitruvius's description of the triangular machines to mean that the three faces corresponded with the three types of drama and that the required face of a number of prisms was viewed through the open doors of the scenic façade. (From the early days of the great revival of interest in perspective, artists had been engaged painting walls in rooms, corridors, and gardens of private houses to give an illusion of a continuance of the scene.) The interpretation of Barbaro was put into practice perhaps before his book appeared, certainly soon after. Palladio built a theatre in Venice in 1565. He commenced the *Teatro Olimpico* in Vicenza in 1578. This was built for the Olympic Academy, of which he was one of the founders, and for which Serlio had built an experimental stage. Palladio died in 1580, and the theatre was completed by his son in 1584. Palladio's pupil, Scamozzi, carried out a stage scene which was derived from the interpretation of Vitruvius, as held by Barbaro, but instead of being on revolvable triangular frames, streets, five in number, were built to stretch back some twenty-five to thirty feet from the scenic façade. *Proscenium doors* or entrances at either side of the forestage were also provided with such streets. Perspective paintings were designed to close the distant prospect. This theatre, which still stands, represents the best ideas of the time. It was visited and studied by Inigo Jones (1572–1652). Scamozzi built a model theatre at Sabbioneta, in 1588–90, the present existence of which had been overlooked by historians until Mr Gordon Craig called attention to it in an article in *The Architectural Review* (Dec. 1923). In 1618 Aleotti completed the *Teatro Farnese* in the ducal palace, Parma. This also still stands and is a splendid witness to the genius of the designer and the generosity of his patron. It has a wide proscenium arch.

The academic buildings were at first occupied by academic actors, who learned their lines by rote and were aided by a *prompter*, whose box was sometimes placed in the middle of the front of the stage, or, at other times, within one of the wings in what became known as the prompt corner or side, P. S., that on the other side being the opposite prompt or O. P. side. The *Commedie Erudite ed Antiche* were soon opposed by amazing companies of professional actors and actresses who performed *all' improvista* or *a soggetto*, the *Commedie dell'Arte*. The finest of the improvising companies, early that of *il Ruzzante*, then those of *I Comici Confidenti*, *I Comici Accesi*, *I Comici Gelosi*, were eagerly invited to the royal and ducal courts of Europe. Their arrival was celebrated by tournaments; the most distinguished of their members were honoured by emperors, and their children held at the font by kings and queens; cardinals banqueted them and poets sang their praise. Isabella Andreini and her husband, Francesco Andreini, truly lived up to the motto of the company of which they were the pride—*Virtu, Fama, ed Honor ne fer gelosi*. Tasso celebrated the beauty of this lady, who was herself an accomplished poetess. On her death in the town of Lyons, at the early age of forty-two, while on a journey from the French court to that of Mantua, she was buried with civic honours, 1604. Her husband retired from acting and edited her writings and his own. Their son, Giambattista, headed a new company, *I Comici Fedeli*. From improvisation he elaborated many pieces, notably an opera, *Adamo*, which has been compared with the *Paradise Lost* of Milton. Alberto Ganassa, of Bergamo,

famous in the part of *Arlecchino*, took the traditions of the improvisers into Spain, where he appeared with a company at the court of Philip II. in 1574. At a later period, there followed in the extempore school of acting, Tiberio Fiorilli, known as *Scaramuzza*, the delight of the young Dauphin, who was destined to become Louis XIV., and the master chosen by Molière. The spirit of improvisation and brilliant experiment was shared by the scenic artists. A great wave of enthusiasm for theatre building spread over Europe. The neo-Vitruvian theories which determined the structure of playhouses on the Continent were also at work in England.

The Early English Theatre.—Henry VII. had a royal company of actors, and he granted a licence to a public company, which acted in inn-yards and cock-pits on improvised stages. At court Italian artists and craftsmen were employed to produce spectacle after the famous Italian manner. Henry VIII. inherited his father's taste and, in 1527, he built a 'place of plesyer,' called Long House, at Greenwich. In it Italianate masques and revels were held. Sir Thomas More, whose powers of improvisation first gained him preferment, was one of the animating spirits. Holbein decorated the house.

Documents, believed to date from 1573, indicate the tasks of those appointed to the Office of Revels in Elizabeth's reign: *The connynge of the office resteth in skill to devise, in understandinge of historyes, in iudgement of comedies, tragedyes and shewes, in sight of perspective and architecture, some smacke of geometrye and other thinges wherefore the best helpe is for the officers to make good choyce of cunynge artificers severally accordinge to their best qualitie, and for one man to allowe of an other mans invencion as it is worthie.* The Accounts, after 1564, show entries for the provision of *scenes*, the first being for the Christmas season, and specifying payments to linen drapers for '*canvas to cover diuers townes and howsses and other divisses and Clowds ffor a maske and a showe and a play by the childerne of the chaple*,' &c. The absence of earlier entries for scenes in the Accounts is not to be taken as conclusive proof that they were not in use before. When James Burbage built the first public theatre, known as The Theatre, in Moorfields, Shoreditch, in 1576–77, it was at once recognised as being after the Italian model, and preached against as 'the gorgeous Playing place erected in the Fieldes,' and, 'even after the manner of the old theatre at Rome, a show place of al beastlie and filthy matters.' Burbage was a member of the Earl of Leicester's players, a company which had been in existence since 1559. It is more reasonable to conclude that his ideas of theatre construction were derived from the culture prevailing at Kenilworth Castle, where plays were performed, than from cockpits, as has been adjudged. The Theatre certainly was used for sport, and the name *pit* popularly substituted for the classic 'orchestra.' A second theatre, The Curtain, was soon built near by, and references are found to 'the painted theatres' of Shoreditch. Then followed The Blackfriars, 1577; Paul's, *c.* 1581; Newington Butts, *c.* 1586; and The Rose, between 1587 and 1592. In *Plays confuted in Five Actions*, 1582, Stephen Gosson maintained that the devil entices the eye at the playhouse with 'nothing forgot that shall serve to set out the matter with pompe or ravish the beholders with variety of pleasure.' The Swan theatre was built in 1595. A drawing of this was discovered, in 1888, in the Library of Utrecht, in a MS. of Arend Van Buchell containing information communicated by his friend Johannes de Witt, who had paid a visit to London, presumably in 1596. The Van Buchell sketch is therefore second-hand information. It is only a crude thing by an untrained hand, and by its first interpreters this crudity was transferred from the drawing to the subject, so that it was held to prove that the Elizabethan theatre was a poor makeshift. Reflection shows that if an engraver of genius had

Fig. 2.—The Swan Theatre, London, in 1596.

recorded the same scene the impression would have been finer. It must be correlated with the remarks in the MS. that, 'its form seems to approach that of a Roman structure,' and its columns were, 'painted in such excellent imitation of marble that it might deceive the most cunning.' The drawing gives the classic designations to the parts of the building, which has a round arena, a raised proscenium platform projecting into it, and a dramatic scenic façade, with its doors, upper story, and windows. The arena is unroofed, while the inner stage has a cover, known in Elizabethan stage parlance as 'the heavens' or 'the shadow.' Above is a turret in which were the classic machines for the descent of the god in the cloud, for the production of lightning and thunder. In battle scenes, ordnance was let off from its apertures. Behind the façade is the actors' 'tiring-room.' In the early days of the Elizabethan theatre, partly because of its private entrance and distinctive position, the lords insisted on occupying the room over the stage, which became known as 'the lords' room,' and viewing the play through its windows, though some of these were sometimes needed for the action of the play. Later they abandoned this for the front seats around the orchestra, which position usurped this designation for a period, as shown in the Swan sketch. The vain and pushful annoyed the actors and common spectators by sitting on the edge of the platform. It has been held that this custom alone would be fatal to the production of scenic illusion, but that would depend on the genius of the actors. Irving could create an illusion when reciting in a drawing-room with people close to him. When the Globe Theatre was built in 1598, incorporating material from the dismantled Theatre and all the best ideas

available, a rail was put round the platform. No authentic view of this theatre, forever to be remembered as the great scene of Shakespeare's activities, is known. Its form can only be deduced from a knowledge of the inherent requirements for the enactment of drama, from knowledge of the pronounced tendencies of the foremost theories of the age, from the Swan drawing and three other drawings of pre-Restoration theatres, and from documents the most important of which are copies of the plays known to have been enacted therein and the *Henslowe Papers* which include the building contract for the Fortune Theatre (1600). One popular misconception of the present day needs to be removed. That is the ill-founded notion that 'placards' took the place of other scenic symbols. Inscriptions of a decorative kind were used, in the elaborate scenic productions of the court, to fulfil the primary function of a playbill in announcing the title, and, it might be, the author and scene. There was nothing puerile in the manner in which they were introduced. The popular theatres saw the value of this as of other ideas from the same source and used it on occasion. The question as to whether or no perspective scene-painting was used at all at the Globe was first debated in print in Malone's *Historical Account of the Rise and Progress of the English Stage*, in the third volume of the Boswell edition of Shakespeare, 1821. To Malone's examination of the subject, concluding that such scenes were not employed, are there appended the comments of Steevens, who held that they were. The preponderance of 19th-century criticism, made by writers whose chief interest was in writing, was heavily on the side of Malone. The inquiry made by Sir E. K. Chambers, Mr Gordon Craig, Miss L. B. Campbell, and others into the facts concerning the Italian influences at work shows the view held by Steevens to be the more likely. Malone's blindness to the full course of the stream is apparent in his opening paragraph in which he says, 'The drama before the time of Shakespeare was so little cultivated, or so little understood, that to many it may appear unnecessary to carry our theatrical researches higher than that period. Dryden has truly observed that he "found not but created first the stage." . . . A minute investigation therefore of the origin and progress of the drama in England will scarcely repay the labour of the enquiry. However . . .' and he gives a few points, the significance of which he fails to see. The 'placard myth' dates from Malone. Being familiar with certain few references to inscriptions in the text of some old plays, he hazarded the conjecture that these were habitually used, 'in the early part at least of our author's acquaintance with the theatre,' in place of scenic changes. The tentative suggestion was converted by others into a statement of fact covering the whole pre-Restoration period. Armed with this dogma, those with an inability to appreciate the essentially plastic and visual nature of theatric art deprecated the needs of the scene as subsidiary and accessory. The occasional use of inscriptions by the Elizabethan public players is no proof of the absence of scenic study. They had not the funds available to rival the court performances in expenditure, but no divergent theory is yet evident. They frequently gave command performances before the queen, and there seems to have been a reciprocal borrowing and lending of apparatus for court and public performances. The second Blackfriars Theatre, which had been commenced by James Burbage and, on his death, completed by his son Richard in 1596, for the first six years of its existence was virtually a court theatre subsidised by Elizabeth. After this, the Globe company used it as a winter theatre, it being a roofed building. It was a small rectilineal hall with three galleries along three sides. The best seats were on the ground floor. Prices of admission were high, so it was regarded as exclusive or 'private.' Artificial light was used, in both indoor and open-air theatres, to gain dramatic ends. Torches were brought in, or candles lit, in broad daylight, to symbolise a night-scene. The stages were provided with machinery including *traps*. A practical working fountain is required for *Cynthia's Revels*, which play of Ben Jonson's was performed at the Blackfriars. Burbage was famous as a visual artist, not merely for his powers of rhetoric. The complementary nature of visual and dramatic art is recognised in the *Character of an Excellent Actor*, drawn from Burbage, by Sir Thomas Overbury: 'He is much affected to painting and 'tis a question whether that makes him an excellent player or his playing an excellent painter.' The description of the great painting of the fall of Troy, in *The Rape of Lucrece*, is not that of a dramatist who would repudiate scenic art such as the Italians were then producing. Three generations of the Ferrabosco family were employed in England, the eldest being in this country by 1562. The diary record of an eye-witness at a performance of *Macbeth* at the Globe, made by Dr Forman, is not like the impression of a spectator who had merely read a placard: Macbeth and Banquo were to be observed 'riding through a wood.' The universities, grammar-schools, and inns of court had been giving plays, in what they reckoned to be the classical manner, from early in the 16th century. Dr Boas, in *University Drama Under the Tudors*, concludes that, 'There is little here to give countenance to the traditional view of the primitive simplicity of Elizabethan stage-arrangements.'

By a statute of 1572, actors who were unlicensed to a baron of the realm or person of higher degree were classed with rogues, vagabonds, and beggars, and liable to whipping. As in Athens, men and boys enacted all the rôles in the public theatre. Thus the two highest peaks of theatrical history were reached with an exclusively masculine organisation. The heroine was acted by a beardless boy; while the older female characters were represented by full-grown men. Great reputations were made by actors in both lines, notably by Edward Kynaston as a boy-actress, and James Nokes as an old woman. The heroines of Shakespeare are never placed in situations which it would be embarrassing and ridiculous for boy-actors to portray. A certain reticence and selection was forced upon the dramatist, whether he chose it or not, which the introduction of actresses destroyed. To what extent masks were worn is not known. Coleridge and Shelley both expressed the opinion that the Shakespearean drama requires masks, and observed how much was lost by their neglect. They hoped that an effort would be made to revive this art. Masks were used by the Italian professional actors, as a matter of course. In the Eastern theatre, which had something in common with the European classic ideal, masks were developed with consummate skill, and are maintained to this day. Oscar Wilde's essay on *The Truth of Masks* can be recommended for its discussion of Shakespeare's use of costume.

Inigo Jones, schooled in the finest Italian theory and practice, in collaboration with Ben Jonson and others, produced masques for the early Stuart court in a manner which enchanted all beholders. The writers saw that, 'In these things, wherein the only life consists in shew, the art and invention of the architect gives the greatest grace and is of the most importance; ours the least part, and of the least note in the time of performance thereof.' Some began to show jealousy, though they still had their own literary fields to themselves. But Ben Jonson, in his published *Works*, had written of the

beauty of a masque, 'Only the envy was that it lasted not still; or, now it is past, cannot by imagination, much less description, be recovered to a part of that spirit it had in gliding by.' He testified that a purely theatric performance, like the lily of his famous verse, 'although it fall and die that night,' may manifest a loveliness which no words can express. In his embittered years, when he had become, as William Drummond of Hawthornden testifies, 'a great lover and praiser of himself, and contemner and Scorner of others, given rather to lose a friend than a jest, jealous of every word and action of those about him,' he penned his *Expostulation with Inigo Jones*, with its oft-quoted ironical line, 'Painting and carpentry are the soul of the masque.' They are so, just as 'soul is form and doth the body make,' but this Jonson failed, and those who side with him in this matter still fail to understand.

The first five books of Serlio's *Seven Books of Architecture* were translated into English, in 1611, at the instance of one Robert Peake, who is presumed to be the Robert Peake known to have held the office of serjeant-painter to James I. Coryat visiting a Venetian theatre in that year, remarked that, 'The house is very beggarly and base in comparison with our stately Playhouses in England; neither can their actors compare with us for apparell, shewes, and musick.'

Such men as Wotton, Evelyn, Bacon, Wren, showed great interest in stage architecture and 'shewes.' A new edition of *Pratica di Fabrica Scene e Machine ne' Teatri*, by Nicola Sabbatini, in 1638, based largely on an earlier work by Ubaldi, summed up all that was regarded as finest in the craft. From Malone onwards, through the 19th century, writers mistakenly cited this work as initiating Italian scenic influences in England.

The first public opera-house, the rebuilt Teatro di San Cassiano in Venice, was opened in 1637. Movable scenery, behind a single proscenium arch, was regularly employed.

French Influences.—In France, where Italian scenic artists and companies had appeared since 1548, and possibly earlier, Cardinal Richelieu conceived the ambition of making the finest national theatre in Europe. He caused a model theatre to be built, especially adapted for the display of changing scenes. He founded the French Academy, whose members ceaselessly debated the *Poetics* of Aristotle. They clung unanimously to the 'Aristotelian' principles of unity of time, place, and action, while the dramatic artists were demonstrating that the only unity which matters is unity of dramatic action. They were divided by the contradictory passages in the *Poetics*, in which 'decoration' is first recognised as a necessary part of a performance and subsequently held in question. The treatise had been written when the power of sophistry had upset the proportions of dramatic art as exemplified in the productions of the highest master, Æschylus. Students clung to one passage of the *Poetics* or the other accordingly as their delight lay the more in visual or in literary art. Richelieu appointed Mon. Hedelin, l'Abbé d'Aubignac, to the position of superintendent of the theatres of France. In 1640 Hedelin undertook to write a treatise, *Pratique du Théâtre*, which he published in 1657. An English translation, *The Whole Art of the Stage*, appeared in 1684. It contains the abbé's interpretation of classical theory and a project for a great theatre, the erection of which the death of Richelieu, in 1642, had prevented. The demand of the French Academy for 'verisimilitude' and 'probability,' matters most earnestly and quaintly discussed in this book, led to the scenic artist being regarded as definitely the subordinate of the writer by those whose chief interest was in literature. Cardinal Mazarin introduced Italian *Opera Musicale* in 1645.

In England during these years, Sir William Davenant had long nursed the desire to produce opera as he learnt the Italians were doing, 'after the Manner of the Ancients.' In 1656 he gave *The Siege of Rhodes* at Rutland House. He had the help of Inigo Jones's assistant, John Webb, who continued to work on the scenic methods which had been adopted in the production of court and university performances. The stage on this occasion lay entirely behind the proscenium opening. Side-wings, no longer of the triangular design of the old *periaktoi*, but single *flats*, arranged in the receding order familiar to-day, remained stationary, while back-shutters were varied as 'illustrations' to the play. The use of this term by Davenant shows that he signally failed to appreciate any theory which sought a totality of impression. Painted *borders*, as they are now called, were suspended from the ceiling to screen the upper finish of the side-wings and back-shutters. In 1658 Davenant carried this arrangement into a public theatre, the Cock Pit, Drury Lane, with a production of *The History of the Spaniards in Peru;* this was followed soon after with *The History of Sir Francis Drake*, 'exprest by Instrumentall and Vocall Musick, and by the Art of Perspective Scenes.' Evelyn, who saw one of the operas, described it as being after the Italian way, 'But much inferior to ye Italian composure and magnificence.' There was no consistency between the scenic changes and the changes of dramatic action. The idea that there should be was late in development.

Under a royal grant of 1660, Davenant and Thomas Killigrew were given 'power and authority to erect two companies of players.' Davenant's company, known as *The Duke's*, began to play regularly at Salisbury Court playhouse. It moved to a new theatre in Lincoln's Inn Fields, in 1661 or 1662, where changeable scenes were the much advertised feature. In 1662 a royal patent was issued to Davenant and in 1663 another to Killigrew under which 'they and their heirs and assignees operated for over one hundred and eighty years in London.' The Theatre Royal, Drury Lane, was opened in 1663 by Killigrew with his company, known as *The King's*. *A Short Discourse of the English Stage*, by Richard Flecknoe, 1664, contrasts the magnificence of the new theatres with the simplicity of the old, but adds that, 'For Scenes and Machines, they are no new invention, our Masks and some of our Playes in former times (though not so ordinary) having had as good or rather better than any we have now.' Davenant's patent had authorised the performance of women's parts by actresses, and comedies of intrigue became the fashion both before and behind the scenes. After the Great Fire, Davenant, in 1668, engaged Wren to build him a new theatre in Dorset Garden. Davenant died a few months later, but the work was completed under the management of the actor Betterton, the scenic artist Harris, and Charles Davenant. Grinling Gibbons carved the decorations. In 1674 a new Theatre Royal, Drury Lane, designed by Wren, was built on the site of the first, which had been destroyed by fire in 1672. In 1682 the two companies were forced to unite, and the fine Dorset Garden Theatre was deserted.

In 1660 Giacomo Torelli (1608–1678), 'the theatrical wonder worker of the age,' retired from the Court of the Grand Monarch. Molière, at the head of *Les Comédiens du Roi*, had been producing his comedies in the Petit Bourbon Palace. This theatre was now demolished, and the company was given permission to act in the Palais Royal, where they shared the stage with the actors of

the *Comédie Italienne*. Gaspare Vigarani, who succeeded Torelli, destroyed all vestiges of his predecessor's work and erected the grandiose *Salle de Machines*, the court theatre of the Tuileries. His son, Carlo, was the great artificer for the grand production of the works of Molière and Corneille. Carlo Vigarani built the first opera-house in Paris, as the home of the *Académie Royale de Musique*, in 1672. His influence was felt in the production of opera in England. Bernini, Paradossi Troili, Mitelli, Giulio Paragi, Ferdinando and Francesco Galli da Bibiena are 17th-century designers of great fame. Chiaramonte wrote a book, *Delle scene, e teatri* (1675). In 1690 Duke Ranuccio II. of Parma had two theatres in his palace (the larger seating 4500, and the teatrino seating 2000), two in his garden, and two in the town. Between May 20 and 25 he gave an opera at night in the teatro, an open-air performance before ten thousand people in his garden, and two other operas in his teatrino.

From 1700.—The section devoted to *Théâtres et Machines de Théâtres*, in Diderot's *Encyclopédie*, illustrates the astonishing activity put into theatrical enterprise in the 18th century. Spectacle was no more the fine art it had been when concentrated in Italian academic circles as the expression of consummate artists and scholars. The few simple pulleys, wheels, and grooves which had served them, and Æschylus before them, were now multiplied and complicated with the intention of making scene-changing and 'effects' easier. The increased machinery, Mr Edward Gordon Craig remarks ironically in his book *Scene*, only made them more difficult, so that by 1800 nothing could be changed—all had become *repetition*. The great opera-house of San Carlo, Naples, is typical of this age of *Salles de Spectacles*. Members of the Bibiena family continued to work in the theatre. Other notable designers were Servandoni, Tessi, and Juvarra. The design of a theatre, as by this time established, and as it persisted, allows of space over the stage in which to 'fly' the front curtain and the painted cloths, and from which, as of old, divinities may descend in chariots and clouds of fire. The roof is raised to accommodate these out of sight until called for. The cloths, on *battens*, hang from a *grid*, above which may be a *barrel-loft* in which are windlasses and drums for raising and lowering heavy weights such as the chariot. The whole upper region is known as the *flies*. *Fly-galleries*, from which stage hands raise and lower painted *cloths* in scene-changing, are built against the side walls just above the height of the proscenium arch, or opening. Windlasses and drums may be on either or both of these galleries. Hand-labour alone may raise the cloth and lower it by its own weight. There are lines of pegs or hooks to which the ropes, which run over pulleys, may be tied. The front curtain may be worked from this level, or from that of the stage, as also may the cloths, by windlass or without. Counter-weights may be used to facilitate these operations. At the rear of the stage is a store-space or *scene-dock*, in which scenery can be stored. This space is cleared when the depth is required for the spectacle. (London theatres of to-day have often to dispense with the luxury of this depth on account of the ground rent, and have stores elsewhere.) Over the scene-dock, or where possible, is a *paint-room* in which the scenic artist works. A *property-room* is provided for storing small objects of dramatic use. Whole pieces of scenery can be raised through large transverse openings in the stage by means of platforms, which are termed *bridges*. These work in and out of the *well*, or *cellar*, a space under the stage nearly as deep as the proscenium opening is high. There is an intermediate floor running round the well, which is called the *mezzanine*. It is about 8 feet below the stage, and from it the *star trap* and the *vampire trap* are worked. These are contrivances for the sudden appearance or disappearance of spirits. In the case of the vampire trap the actor throws himself against a couple of shutters in the stage, which open to let him through and immediately close again with great force, he landing on a mattress placed to catch him on the mezzanine. The star trap is cut in the stage like a star, with the points meeting in the centre. The actor stands on a little platform on the mezzanine, which is run up with tremendous force by counter-weights against the stage. The actor's head opens the points of the star, through which he shoots like an arrow, and before he reaches the stage again the star has closed and is kept solid by the platform on which the actor came up. Farther 'up' the stage—i.e. nearer the back scene—is the *grave trap*, used, for instance, at Ophelia's funeral. These are the chief traps, but the whole stage of a theatre is practically movable, the only immovable parts being the narrow joists, which are called *runners* or *fillets*.

The first Royal Opera House, Covent Garden, was built in 1732 by John Rich, who had come into the Davenant-Killigrew patents. The Little Theatre in the Haymarket opened in 1720 and was unlicensed. In 1736 Fielding here produced his satirical comedy *Pasquin*, which gave great offence to Walpole and led to the passing of the play *Licensing Act, 1737*, and the institution of the office of *Examiner of Plays*. The theatre gained its royal patent, and a licence to open from 15th May to 15th September each year, as consolation to Samuel Foote, its manager, who had lost a leg through an accident which happened to him while riding with the Duke of York. Enlarged and otherwise improved it reopened as the Theatre Royal, Haymarket, in 1766. Garrick has often been credited with having introduced *footlights* into England at Drury Lane Theatre, in 1765. Footlights, however, are shown, together with hanging chandeliers, as the lighting of an indoor theatre, in the frontispiece to Kirkman's compilation, *The Wits*, 1673. Provision is made for them in the directions of Sabbatini. A footnote to a satire, *The Theatre*, 1771, confirmed by Malone, makes it evident that Garrick's improvement was the substitution of concealed *winglights* for the visible candle-rings or chandeliers, in 'the focus' of which actors had hitherto been seen. The new winglights were fixed on *ladders* which could be revolved to heighten or lessen the power or to produce changes of colour. Their electrical substitutes of to-day are called *lengths*. Footlights are sometimes called *floats*, an early form of them having been constituted by wicks threaded through corks which floated in a long, shallow bath of fish-oil. Decrease or increase of light was effected by lowering the trough under the stage or raising it to the level. In 1777 Garrick introduced the continental ideas of the scenic artist, De Loutherbourg, to Drury Lane Theatre. The subsequent admission of the scenic artists—De Loutherbourg, Clarkson Stanfield, and Roberts—to the rank of Royal Academicians aroused the protest of a world of critics who were unaware of the aristocratic history of scenic art and of the association of the divine Raffaello with its renaissance.

The *Comédiens Français* acted from 1689 to 1770 in the *Théâtre de la Comédie Française* (*Théâtre Molière* or *l'Illustre*), then situated in the *Rue des Fossés St Germain*. The shell and remains of this famous stage can still be seen facing the old *Café Procope* in the renamed *Rue de l'Ancienne Comédie*. They then moved to the *Salle de Machines* in the Tuileries. In 1782 the company left here for a new

home constructed on the site of the *Hôtel de Condé*, where stands the *Odéon* of to-day. In 1789 or 1790 this theatre took the name of *Théâtre de la Nation*. In 1791 the actors broke into two parties, one group crossing back over the Seine to the *Théatre de la République* in the *Palais Royal*, Rue de Richelieu. In 1793 Mlle. Montansier opened her *Théâtre National de la rue de Louvois* (part of the *rue de Richelieu*), facing the *Bibliothèque Nationale*. Molé of the *Comédiens Français* went over to this house. Fifteen days later, 3d September, all the actors, with the exception of the favoured Molé, were imprisoned. The records of the following years are full of troubles and changes until the nomination of Napoleon as first consul in 1802, when the *Théâtre Française*, with Talma, Fleury, and Molé in the company, was housed in the building in the *Rue de Louvois*. In 1804 the troupe was called *Comédiens de l'Empereur* and their home *Le Théâtre de l'Impératrice*.

Napoleon, by the *Décret de Moscou* 1812, brought together a number of reforms which he had been making since 1802, for the superintendence, administration, and discipline of French theatres. He gave Paris two weeks in which to close its many hundred theatres; eight alone were to be thoroughly developed. Provision was made for the training of actors and actresses at the *Conservatoire Impérial de Musique*. The clauses of this decree with very little alteration govern the state theatres of France still. The Opera House of Vigarani was succeeded by the present building, designed by Charles Garnier, 1875. The present *Théâtre Français*, adjoining the Palais Royal, is a reconstruction made after a fire, 1900.

Gas slowly replaced candles and oil, Drury Lane leading the London theatres (*c.* 1814). The brighter illuminant was not welcomed at first, as methods of acting and of scene-designing required readjustment. The old lighting, whatever its inconveniences, had lent beauty and disguised shabbiness. Under primitive methods of manufacture the smell of gas was obnoxious, so much so that, in 1828, Covent Garden Theatre closed for a week while the gasometers and apparatus for making gas were removed. (Amusing theatre bills relative to this were printed by Clement Scott in *The Drama of Yesterday and To-day*.) Owing to the terms of its lease the Haymarket Theatre continued to use candles and oil until 1843 when gas was introduced there, and, at the same time, the 'useless' forestage or *apron* was removed and the room appropriated to *orchestra stalls*. The following year J. R. Planché, Somerset herald and dramatist, gave an experimental performance of *The Taming of the Shrew* in what was supposed to be the Elizabethan manner, the stage being draped and placards being used. The loss of the apron must have been felt. An unauthorised performance of one of the pieces of Planché had led to the Act of 1833 giving legal protection to dramatic authors.

Experimental productions of high interest were made by Richard Wagner, who realised, what had been forgotten, that the scene and the play are conceived fundamentally together and as a vision. In this he had the championship of Nietzsche, who wrote *The Birth of Tragedy* to further the ideal. In 1872 the composer laid the foundation-stone of his great theatre at Baireuth in which many fine principles were incorporated.

The band of musicians was concealed under the stage by Wagner. The bands of earlier times had sometimes been so concealed and had at other times occupied space in the orchestra, from which they eventually appropriated the name; or they had, as in Elizabethan times, performed in the gallery in the upper story of the scenic façade.

Pioneer productions were made in England from 1875 to 1886 by Edward William Godwin, F.R.S., an architect and designer versed in the highest traditions. His most notable work was in the production of *The Merchant of Venice*, on the occasion of Ellen Terry's first appearance as Portia, of *Claudian* and *Hamlet* for the actor Wilson Barrett, of *As You Like It*, as a pastoral in Coombe Wood, for Lady Archibald Campbell, and *Helena in Troas*. For this last named he constructed a temporary theatre, on the Greek model, within Hengler's Circus. Herbert Beerbohm Tree made an early appearance, as Paris, in this production and afterwards, paid tribute to the inspiration which he owed to its producer. Ellen Terry, in her autobiography, tells how the influence of Godwin, from the time she was fourteen, led her to '*think*' and to '*aspire*.' The knowledge which she gained from this source she was able to put at the service of Henry Irving in the productions at the Lyceum Theatre, which together they made unforgettable. Irving's management of this theatre opened in 1878.

In 1888 Tree, as manager of the Haymarket Theatre, was able to advertise, '*Electric light throughout the auditorium*,' but it was some ten years before a full installation was adopted on the stage. The Saxe-Meiningen Court Company brought their own plant when they played *Julius Cæsar* at Drury Lane in 1881, in which theatre it was installed in 1889. The first iron curtain had been used here in 1794, and a *safety curtain* was fixed in 1898. Hydraulic lifts were built on the stage in 1897. The use of *lime-light* (see DRUMMOND LIGHT) came into theatres during the 1880's. This is now suffering eclipse by the more powerful light of gas-filled electric lamps and other inventions, but the proverbial phrase 'in the limelight' has entered the language.

Amongst the professional scenic artists employed by Irving and Tree were Hawes Craven, Cuthbert, Telbin, and later Joseph Harker. Partly from policy, Irving interested such famous studio-painters as Alma Tadema, Burne-Jones, Madox Brown, Gustave Doré, Seymour Lucas, and John Tenniel in designing for him. Distinguishing between the value of the work of artists *of* the theatre and artists *in* the theatre, Ellen Terry's son before long had the temerity to question the value of this incursion. The over-elaboration of some of the productions of this time led to a reaction and an ignorant press campaign against the use of any form of scenic art.

The financial difficulties of theatre enterprise in an industrialised world were growing more apparent. The ground rent of the Opera House, Covent Garden, in 1732 was £100 a year; in 1761 this was raised to £300, and in 1792 to £940. London statistics, issued by the L.C.C., shows increases by thousands in rateable value.

The physical strain of running a theatre with rising costs became too great for an artist of Irving's stamp, and in 1899 he was expropriated by the Lyceum Theatre Company, Limited.

It is significant that Henrik Ibsen (1828–1906) retired from the direction of the bankrupt theatre of Christiania in 1862, and from being a *playwright* became what he recognised as being a lesser thing, a play*writer*—the most famous of his time in the world. He found the material of the theatre impossible of control, but he averred its control to be necessary 'if our theatrical art is not to perish altogether.'

August Strindberg (1849–1912), of Sweden, and Stanisław Wyspiański (1869–1907), of Poland, struggling against hard conditions, devoted genius to exemplifying that there is a high art of the theatre which is not included by the art of writing.

André Antoine founded the *Théâtre Libre* in 1887, and produced the works of the serious writers of the time, but they proved too serious for the mood of Paris. Antoine has been manager of the *Odéon*, and is recognised as the most able man of the theatre in France to-day, but at present he is unemployed.

In 1878 George Godwin, F.R.S.A., published a tract on *The Desirability of Obtaining a National Theatre*. A larger work on *A National Theatre*, by William Archer and Granville Barker, came out in 1907. A Shakespeare Memorial National Theatre Committee was formed and still endeavours to raise means for such a theatre. In 1904 a school of dramatic art was founded by Herbert Beerbohm Tree, which in 1920 was granted a royal charter. The theatre of this, the Royal Academy of Dramatic Art, was opened in 1921. Charles Dickens had helped in the foundation of an earlier Royal College of Dramatic Art, a charitable establishment for theatre-workers with a school, museum, and library, in 1860. This came to nothing. A lectureship in dramatic art was founded in 1921 at Liverpool University by Colonel Shute. Since 1925 the senate of London University has held examinations for a diploma in Dramatic Art. At East London College a school of dramatic study and research was inaugurated by Dr Allardyce Nicoll in 1925. Harvard University has a department of dramatic study which was for some years directed by Professor G. P. Baker, who made his 'Workshop 47' well known. In 1925 Yale University received a gift of one million dollars for the building of a theatre which Professor Baker now directs. The small Shakespeare memorial theatre at Stratford-on-Avon built by a local resident was destroyed by fire in 1926. The help of America is being sought towards raising a large sum for rebuilding on a large scale with endowment and foundation of a school.

A motion in favour of establishing a national theatre was brought before parliament by the first Labour government. The consideration of the question of the grant of a subsidy was deferred until such time as a national movement sufficiently strong should manifest itself. It may be remembered that the Athenian government of old only undertook supervision when the nation had demonstrated its unanimity. Royal, state-owned, or state-subsidised theatres exist under every European government except the British to-day. The Irish Free State on coming into being immediately granted a small subsidy to the Abbey Theatre. The policy of state-organised theatres in modern times is conservative. Exceptional talent has been known to work uneasily under the control of a committee of officials and to break away.

The Art of Acting.—Architects, painters, and musicians have recognised that, in the arts, genius, like ordinary intellect, must needs be amenable at first to such laws as preceding masters have been able to formulate from the sum total of their experience; have recognised that a license may afterwards be claimed to break away from a more or less improvised and arbitrary rule in such respects as it is defective and its basis unsound and insufficient; have recognised that genius in this way finds a truer definition of the law; and that it is by such means that expansion in the power of their arts has been made. The wiser of them see that the purpose of theory is to provide a basis of appreciation, of criticism, not a recipe for the production of art; that the mind requires some standard from which to measure vagaries. This the actor has been slow to understand. 'Rules may teach us not to raise the arms above the head; but if passion carries them, it will be well done; passion knows more than art,' said a spokesman representative of a host, though not of all (Baron, of the *Théâtre Français*), with 'theatrical' emphasis. That natural impulse is more to be trusted than reason is the actor's claim and often his excuse for shirking further analysis. This attitude explains why many fine critics who have been fascinated by the activities of the stage have looked askance at the claim of the performer to the title of artist at all. The actors' trust in passion as a sure guide could only be allowed if the human species were still living in the age of innocence, acting, in correspondence with its order in creation, with the unreflective surety of the bee or the ant. But since ours is a fallen world, the actor's passions, untutored by reason, cannot be relied upon to o'erstep not the modesty of nature and so not to make the judicious Hamlet grieve. The actor will not arrive at an understanding of the scope of dramatic art by claiming the supremacy of passion and neglecting reason, but by studying the true relationship of instinct to reason and the complementary parts which these have played in the development of the theatre and the drama of which he is an instrument.

Antiquity has bequeathed us no treatise on acting. Its philosophers, however, were interested in the first question as to whether the existence of the actor were justified at all, and if so, how justified.

The rational mind of Socrates was unable to reconcile itself with theatrical representation; the didactic plays of Euripides were the only ones that he cared to attend. He is shown, in *The Republic* of Plato, defining art as imitation, twice removed from divine truth, and as the worthless mistress of a worthless friend and the parent of a worthless progeny: 'The peevish temper furnishes an infinite variety of materials for imitation; whereas the temper which is wise and calm, is so uniform and unchanging, that it is not easily imitated; and when imitated is not easily understood, especially by a general gathering of all sorts of persons collected in a theatre. For these people witness the imitation of a state which, if I am not mistaken, is far from being their own.' He concludes that a republic which would enjoy a good constitution will be justified in denying admission to the imitative poet (and with him, therefore, the actor), 'because he excites and feeds and strengthens this worthless part of the soul, and destroys the rational part.'

Euripides, in his old age, emerged from the influences of rationalism to the extent of singing:

> Knowledge, we are not foes.
> I seek thee diligently;
> But the world with a great wind blows,
> Shining, and not from thee;
> Blowing to beautiful things,
> On, amid dark and light,
> Till Life, through the trammellings
> Of Laws that are not the Right,
> Breaks, clean and pure, and sings
> Glorying to God in the height.
> (*Bacchae.*)

Following the condemnation of Socrates, came the recognition of Aristotle that imitative or representative art may be justified on the ground that, firstly, 'to learn gives the liveliest pleasure, not only to philosophers, but to men in general; whose capacity, however, of learning is more limited,' and learning can be effected through the satisfaction of the instinct of imitation implanted in man; and secondly, because 'there is the instinct for "harmony" and rhythm, metres being manifestly sections of rhythm. Persons, therefore, starting with this natural gift, developed by degrees their special aptitudes, till their rude improvisations gave birth to poetry,' and thus to drama.

Dramatic expression procedes from improvisatory

forms to studied form, not only over one period, but over successive, and, it may be, overlapping, periods. The powers signified to the Greek mystics by Dionysus and Apollo belong to all time. The one is immediate spirit and the other calm reflection. We call them instinct and reason. They have shown themselves at times to be mutually antagonistic; by this antagonism they have instigated one another; and there have been occasional periods of reconcilement in which the balance of dramatic art has been attained. Provision must be made for their exercise to-day, if art is to be witnessed to-morrow.

Much dramatic criticism shows itself impatient of the times of improvisation, disdaining the immature, heedless of the seedtime and caring only for the literary harvest. The process, however, goes on in spite of those who would drive a red-hot poker through 'the dreary propaganda of clownship,' failing to see in the clown and the knock-about comedian the genesis of a Molière; and of those who object that the puppet is only a bag of sawdust or a stick of wood and are incredulous when reminded that this little figure is a descendant from the animated image of a god who taught the Asiatic and the Greek actor to have style, and doubtful of the promise that in a healthy dramatic environment the old stature will be re-attained. The more penetrating criticism which has studied to understand the origins of art in its improvisatory stages brings an added wisdom to the appreciation of mature forms.

That mediæval art took a lead from the Provençal poets and their neighbours is generally allowed. The art of the troubadours encouraged improvisation. In their *Courts of Love*, held during the 12th century, in every palace and castle in the territories south of the Loire, a dramatic *tenson* or contest was held. A subject was proposed, in extempore verse, by one lordly competitor, and answered, in a stanza of the same measure and order of rime, by another. On the conclusion, the court deliberated the merits of the question and the skill shown by the competitors. On some occasions ladies answered extemporaneously the verses which they inspired. The compositions followed certain rules, whilst, at the same time, it was recognised that the spur of the moment may be a wonderful thing and may prompt expression leading to a finer appreciation of art. The academies of Europe, when they came into being, sometimes encouraged these improvisatory exercises, but more often they devoted their studies to the analysis of classic forms and the more ponderous composition and performance of tragedy and comedy on ancient models. The academic theatre was confident of a superiority to the stage of the improvisers which grew up outside. But there came a day when one of its own students, with all the studied capabilities of the school, glanced over the road, listened to the spontaneous laughter and applause, noted a sudden breathless hush, and then crossed over to discover some magic which the academy had not taught him, apprenticed himself to the vagabond players, fathomed their secret, and became their leader, guiding natural high spirits by his educated criticism. This is what happened in the notable case of Angelo Beolco (1502–42), surnamed *il Ruzzante*, 'the quick of wit,' who is regarded as the founder of the *Commedia dell'arte*. Beolco forswore academic models and trained a company of improvisers on a principle of which he was deeply convinced. The literary student has difficulty in crediting this principle with the importance which *il Ruzzante* attached to it as, in fantastic costume, he stepped before his public and said:

'Let us amuse ourselves a little. Is there any one amongst you who knows who I am? You have the air of wishing to reply that I am Mercury, or the reciter of arguments from comedies. No, you will never guess it. I won't leave you in doubt any longer. I am an elfin spirit. Do you know why I show myself? Why I permit you to see me? Do you know whence I come? From the other world; and I will tell you why. One of those who are there, called Accius by some and Plautus by others, has sent me to tell you that since a comedy is to be played this evening you are not to blame me if it is not in Latin and in verse and in beautiful language, because if to-day he were among the living he would not write comedies in any other style than that of this which you are about to witness. He begs you not to judge by this one those which he left written; for he swears to you by Hercules and Apollo, that they were recited in other days in terms very different from those which you see printed now, for the very good reason that many things which look well on paper look ill upon the stage.'

This maker of plays learned by stage experience that words in themselves unremarkable may acquire remarkable significance from the circumstances in which they are spoken, while fine writing may prove too fine for the conditions of the theatre and require to be pondered in the study. Drama is not in the words but in the situation, in the relationship of the actor to his environment. Words may help to an appreciation of the situation, but they are not indispensable. Objectors to this argument feel that there must be some flaw in its logic, because Shakespeare seems to them to be the highest dramatic expression, and comes to them through the medium of language. But critics of great discernment, as Lamb, Hazlitt, Coleridge, have never been satisfied that the stage performance of Shakespeare (from the plays as 'printed now') equals the impression which they derive from the reading; while the testimony of very high intelligences is that the performances of the best troupes of the *Commedia dell'arte* realised their imaginings.

It seems that the bare information that these actors improvised from a mere outline, a plot, or scenario, which was pinned up in their sight behind the scenes, and a glance at which sufficed to prompt their performance, has left readers incredulous. For the reader, mentally putting himself in the place of the actor, feels that his own mind would be a blank if confronted with such a situation. It has to be realised that the plot was a deduction from action which had already been rehearsed in many forms and built by practice. Many associations with it had been memorised. The method allowed the actor to veer and return to line according to the feeling in the air and the mood of those to whom he found himself playing, and an electrical atmosphere might be generated from which trained genius might catch inspiration. Some help towards understanding the quality which gained Beolco his fame can be obtained to-day from noting the sense of adventure produced by an extemporaneous speech of an adept like Lord Birkenhead, as compared with the reading of a set speech by a speaker who is unable to depart from a manuscript and 'check at every feather that comes before his eye,' according to the vagaries of circumstance. Such skill must have a fund of observation and experience on which to draw. Coleridge said of his improvisatory lectures, 'I take far, far, more pains than would go to the set composition of a lecture, both by varied reading and by meditation.' And many of his auditors declared that 'they never felt so secure of a good lecture as when they perceived that I had not a scrap of writing before me.' The masters of this method give a lesson to those who read by rote.

The discovery of some 'platts' or plots preserved

from Elizabethan times (one of which is amongst the papers left by the actor, Edward Alleyn, and preserved at Dulwich College which he founded, while four others are in the library of the British Museum) suggested to Benjamin d'Israeli reflections on the intercourse between the Italian and English actors, and the possibility that the clown, Tarleton, attempted to introduce the extemporary comedy of the Italians. Dr W. W. Greg, who edited the publication of the plots, which he includes in *The Henslowe Papers*, regards it as an open question whether or no English professional actors ever practised anything like the improvisatory methods of the Italians. The fact that one of the plots is that of a play which had been worked out and was already in print in full, he holds to be conclusive proof that in any case these particular outlines cannot be regarded as comparable to Italian *scenarii*, and suggests that they were merely aids to the prompter and his assistants. This reasoning overlooks the fact that, as Beolco makes clear, it was part of the method of the actors to seize on plays already in full literary form, and to reduce them to a plot, and then recreate an entertainment on the theme according to fancy and circumstance and to the peculiar conditions of the stage. There is evidence that Gianbattista della Porta worked in this way. So the proof as to the English plots is inconclusive. The prompter in a theatre is the man who works from the fullest notes of all that is due to happen upon the stage. The actors, having learned their parts by the doing of them, need only to glance at the sequence of situations for the associations to be called to mind. There are several passages in Shakespeare which show his familiarity with the nature of extemporary acting. English companies did not attain fame on the strength of this principle alone, as did certain Italian troupes. But the spirit of improvisation was behind the expression, as always, and was present in some degree. Hamlet does not confound the artless gags of the clowns, which he would suppress, with the skilled efforts of judicious improvisers. When the court breaks up in disorder after the performance of the play within the play, the prince, on the spur of the moment, is supposed to extemporise four lines of verse. He then appeals to Horatio as to whether this, his skill as an improvisatory actor, would not procure him a fellowship with a cry of players. Horatio votes him only half a share; whereupon Hamlet tries again, to fail deliberately with the final rime. Hamlet's valuable but academic advice to the players received an entertaining reply, calculated to restore the balance of opinion on this important matter, in 'The Extemporary Players' Advice to Hamlet' (*The Mask*, vol. iii.). Molière undoubtedly made a close study of the material which Italian extemporary players had evolved, tested, and found good.

Criticism of acting during the 18th century was still puzzled as to the relative parts played by instinct, or natural sensibility, and by judgment. In 1750 *The Actor: A Treatise on the Art of Playing* appeared. The author was John Hill, M.D., self-styled Sir John Hill. A free translation of this, with many additions, was made by Antonio Fabio Sticotti, and published in Paris in 1769 under the title *Garrick, ou les Acteurs Anglais*. It was this work which prompted Diderot to write his famous *Paradoxe sur le Comédien*, commenced in 1773 but not published until 1830. The writer of the earlier treatise had propounded the question as to whether natural sensibility, the capacity for feeling, was the chief requisite for success as an actor, and had come to the conclusion that a man who was himself a lover could best portray the sentiment of love; a husband who was of jealous disposition could best, as an actor, transmit the impression of jealousy, and so on. This argument filled Diderot with intense disgust, for he saw that an expression of nature is not to be confounded with a work of art. The course of his essay is not always quite logical, nor is it easy to follow, because of the shifting value which he gives to the word 'sensibility.' His question is not only the silly-season topic, for the introduction of which the essay is responsible, Should actors feel? It is the more subtle one, Should actors be subject to their natural capacity for feeling at the time when they are acting? His answer is the right one—No. As 'one writes of falling tears but they do not fall while one is polishing one's verse,' so the actor must represent from the image of feeling and not the present actuality. Only the cool head, a profound judgment, and an exquisite taste can enable an actor to approach the state of being an artist, as that term is used of fine writers, painters, and musicians. 'Extreme sensibility makes middling actors; middling sensibility makes the ruck of bad actors; in complete absence of sensibility is the possibility of a sublime actor.' Diderot fancied that the Garricks of the stage have this absolute and sublime mastery of their personal feelings. In both of these treatises it is recognised that whilst inferior players are content to be poor puppets whose strings are pulled by the writer of plays, finer actors are collaborators, and contribute qualities unconceived by the playwriter. Talma (1763–1826), in his *Reflections on the Actor's Art*, and Irving, in his introduction to the English translation of Diderot's essay (1883), both discussed the question of the sensibility of the actor, but without making the distinction between feeling as existing in nature and as represented in art which Diderot tried to make. Irving, however, recognised that 'It is necessary to this art that the mind should have, as it were, a double consciousness, in which all the emotions proper to the occasion may have full sway, while the actor is all the time alert for every detail of his method.' These arguments rested here until Edward Gordon Craig carried them a step further with his essay on *The Actor and the Über-Marionette* (1907), in which he shows it to be impossible for the human actor to maintain complete absence of natural sensibility. Mr Craig points to the image as the type of perfection to which the human actor approaches as he advances in power until he reaches a point at which he wishes to be neither the puppet of a writer nor yet the collaborator with one, but himself a creative artist even as other artists, forming his own images and directing their animation, these images to be of 'dead' matter till he gives them the life of art. Only so can the actor make the full transition from natural expression to art expression. This is, in fact, what the actor-dramatist Æschylus did in a great way, and to advance in that direction, however slightly, is still to advance from chaos towards design. A clear appreciation of these distinctions is necessary before the analysis of the possible 'art' of acting can proceed.

Lessing (1729–1781) remarked with sorrow that, 'We have actors, but no mimetic art. If in times past there was such an art, we have it no longer; it is lost; it must be discovered anew. There is enough superficial chatter on the subject in various languages, but special rules, known to every one, pronounced with distinctness and precision, according to which the blame or the praise of an actor can be defined in a particular case, of such I know scarcely two or three.' Schlegel criticised the limitations of Lessing's own theory of dramatic art, *Dramaturgie;* he found also that the *Mimik* of Engel, a disciple of Lessing, failed to provide the complete system of mimicry which its author

supposed it to give. A complete system of mimicry would yet not provide the basis for the criticism of the art of acting, for art passes beyond impersonation or mimicry to the representation of ideas. Since the stage, ideally, is the mirror of nature, it follows that the criterion, of which many have felt the need, will only be arrived at by the perfecting of the all-embracing science of correspondences, correspondences of soul and body, spirit and form, which Swedenborg attempted to recall from the wisdom of the ancients. Dramatic study, in some measure related to the teaching of Swedenborg, was pursued by François Delsarte (1811–1872), who conducted a notable school of research in the Rue de Courcelles, Paris. In regard to acting in particular, he attempted to define scales of movement comparable to the basis to which musicians refer their art. Delsarte realised that as between the lowest note of an octave and the highest there are, theoretically, an infinite number of sounds differing in character, and practically, a large number appreciable by the ear, so an infinite series of expressions lies between any feature (as the eye, the hand, the mouth) being closed and expanded to the extreme. As also musicians select a series of sounds differing from one another by well-defined steps or degrees from which to construct music, Delsarte believed that natural physical expression must be given definition before it could be transmuted into an art comparable with that of music. Eastern dramatic technique is in fact based on such definition. An analysis of the tendency of Delsarte's work, correlated with that of Swedenborg in its dramatic aspect, is given by the present writer in *First Studies in Dramatic Art* (1926). This provides, not a prescription for acting, but a criterion from which to measure individual expression in the theatre.

Gustave Flaubert held that 'Art should be raised above personal affection and nervous susceptibility. It is time to give it the perfection of the physical sciences by means of a pitiless method.' Artists of the theatre, of like conscience, feel the truth of this, but their opponents fail to see that, with the physician, they would be cruel only to be kind.

The New Movement —Since the opening of the present century Mr Edward Gordon Craig, by his productions, writing, and designing, has earned for himself a unique position as 'the first æsthetician of the theatre.' The movement founded by him has for its aim the rejuvenation of the whole fabric of the theatre and recognises its art to lie in the transfiguration of its material. It has exposed the fallacy of the mischievous contention that the words of a drama are its *spiritual* part and the visible realisation its *material* part. It distinguishes the intellectual conception or vision as a spiritual thing which may be materially manifested by whatever signs the peculiar conditions of the theatre allow. Gordon Craig was born in 1872 and, in 1876, made a very youthful appearance on the stage in *Olivia*, at the Court Theatre, London, in which play Ellen Terry, his mother, was acting the name part. From 1889 to 1896 he served an apprenticeship to the theatre, acting most of that time in the company of Henry Irving, the memory of whose acting is always present in the pupil's work. After making a number of experimental productions in London, he went to Berlin on the invitation of Dr Otto Brahm, of the Lessing Theatre, for whom he produced a version of Otway's *Venice Preserved*. In 1905 his theory of production was published in German in an illustrated dialogue, *Die Kunst des Theaters*. An appreciation of the full implication of his point of view required a considerable readjustment of the prevailing mental attitude of the workers in the theatre, whom he principally addressed. Though not aiming at an exclusive theatre and trusting to the impression of the naïve spectator, the appeal to the discernment of the sophisticated required to be negotiated with skill if the whole effort which he intended to make to rediscover the 'lost' art of the theatre were not to be compromised. Mr Craig already had in mind the possibility of using the mobile instrument of light to replace the paint of the studio painter's palette; he wanted one *Scene* with a changeable face, rather than static scenery, which, however proficiently shifted, could yet be improved upon. Taking long views, he advised the foundation of a central school of scenic study which should feed the commercial theatre with tested experiments rather than practice in public. Max Reinhardt, who had been an actor in the company of Otto Brahm, and since 1901 the director of the *Kleines Theater*, invited Gordon Craig to produce for him a number of plays. The firm behind Reinhardt, however, wanted 'quick returns,' which it was not to the artist's purpose to provide. So Reinhardt, becoming the director of the *Neues Theater*, the *Deutches Theater* (with its turn-table or revolving stage), and the *Kammerspiel*, with the assistance of Ernst Stern as scene and costume designer, carried out his own interpretation of 'Craig's ideas,' as they were called. The Berlin correspondent of *The Stage Year Book*, 1912, said, 'Reinhardt lives as it were what Craig has developed in the idea.' Reinhardt was hailed as the practical man, while Gordon Craig was regarded with impatience as a fine dreamer. Reinhardt organised the production of the wordless plays *Sumurun* and *The Miracle* from Stern's designs. These startled, interested, and even enthralled London when seen there in 1912. Admirers of the earlier productions of Gordon Craig could not discover the fine quality of his work to be present. Mr Craig had in the meantime been invited, in 1910, by Constantin Stanislawski, to visit the Moscow Art Theatre (founded in 1898), which had been developed from a school of amateur enthusiasts. By his thoroughness and generosity of outlook, together with his own and the collected talent of some half-dozen very able assistants, Stanislawski raised his theatre to the foremost position in pre-war Europe. He had a considerable private fortune, and was able to find supporters who were content to wait for ten years for their first very small dividend. The dramatic method followed by Stanislawski is characterised as that of 'the fourth wall,' which means a technique which aims to give spectators the impression that, in looking through the proscenium opening, they are looking through a supposititious fourth wall at actors who are apparently unconscious of their presence and acting as in natural life. In the production of the plays of Anton Tchekhoff, Stanislawski brought this method to its perfection. His direction to his players was, 'Above all there must be no suggestion of theatricality,' using that word in the derogatory sense which has become attached to it. That, however, did not prevent him from providing Gordon Craig with an opportunity of experimenting further with his opposing principle that 'The theatre shall be theatrical and nothing but theatrical'—redeeming the word from its illegitimate use. The theatres of Europe and America to-day, in so far as they have any conscious art, range themselves behind one or other of these two principles. Stanislawski, with the assistance of Vsevolod Meierhold, who had been a member of his company from its commencement, had in 1905 founded a Studio Theatre as a training ground for new talent. Meierhold here demonstrated his divergence from naturalistic methods. From 1906 to 1908 he directed the Komissarjevskaya Theatre in Petrograd. Meierhold then became director of

the imperial theatres in Petrograd, from which position he exercised a wide influence. He gave opportunities to many scenic artists, and in particular to Alexander Golovin. Gordon Craig's designs and writing were well known to this group before his visit to Russia. The growing number of books bringing information about the theatre of the East shows that it had always been a theatre of 'Belief or Make-Believe,' but never of naturalism, until recent western influences made it waver a little. The Moscow Art Theatre put *Hamlet* into rehearsal in 1911, following the directions of Gordon Craig, and it was produced in 1912 in a 'scene for the poetic drama.' This scene was described in the *Times*, 23d Sept. 1911, and more fully by the inventor in his book, *Scene*. It consists of monochrome screens to which a play of light is related, 'as the bow to the violin,' in expressing the changing character of the dramatic environment. The same year Granville Barker, who had made a reputation as a producer of literary drama, notably of the plays of Bernard Shaw, remarked that Craig, like William Blake, was 'good to steal from,' and began producing plays of Shakespeare in the manner which Reinhardt was proving successful. The fore stage or apron with its proscenium entrances, which had been removed from London theatres as useless, had hardly disappeared when its dramatic use was remembered. *The Elizabethan Stage Society*, founded by William Poel, in 1895, had called for its return. Granville Barker restored it in a temporary form at the Savoy Theatre for these productions. It is now rebuilt in a number of theatres.

Isadora Duncan, who had found little encouragement in London, to which she came from her native town of San Francisco in 1900, from 1904 was able to fill theatre after theatre to overflowing in other capitals by dancing alone or with a company of children whom she adopted and trained. Hers was dancing in the ancient sense; besides having a buoyancy and spontaneity which anyone with eyes to see could appreciate, it had a significance which required some initiation into the silent language of the mime. It had a very clear relationship to the teaching of Delsarte, which the dancer had absorbed at an early age. Auguste Rodin, Henri Lavedan, Eugène Carrière, Augustus John, and other artists of great eminence paid tribute to her unique power. The finest dancer of the Russian Imperial Ballet, Nijinski, recognised that she had an immediate effect on the choreography of that company, members of which were selected in childhood and trained, at the expense of the state, in an exacting technique of Italian derivation. Though, in Nijinski's words, Isadora Duncan opened the door of their cell to the prisoners, these dancers were only able to go a little way on her path, She had nothing to learn from them; they indeed demonstrated most of the things which she avoided in the dance. One touch of their artifice would have destroyed the impression of absolute integrity which she gave. When she appeared in London in 1921 it was left to musical critics to pen appreciations; our dramatic critics seem to have thought that, not being verbal expression, it was out of their line; but in that they were mistaken. Yvette Guilbert also demonstrated dramatic principles which are in need of re-affirmation. She proved that an artist of the theatre may be creative, deriving from literature and other arts but forming an utterly distinct art.

Nicholas Evreinoff, who had in 1908 published a book of theory attacking naturalistic theatre production, succeeded Mierhold as director of the Komissarjevskaya Theatre, Moscow. In 1910 he became *régisseur* of the Krivoye Zerkalo Theatre, and he has since been very active in producing his own plays and a number of books of theory, in which he develops the view that 'monodrama must present the exterior spectacle in correspondence with the internal spectacle.' In 1914 Alexandre Tairoff founded the Kamerny Theatre in friendly opposition to the Moscow Art Theatre, from which some of its actors were drawn. These managements carried on through the time of war, and continue under the Soviet rule.

In Germany, Ernst Toller and Georg Kaiser, following the lead of Frank Wedekind, and in Czechoslovakia, the brothers Karol and Josef Capek, have made reputations as 'expressionist' dramatists of 'stylised' productions. These terms, the delight of some journalists and bane of others, are but tiresome names for a somewhat crude perception of the old truth that art is expression differing in some way from the natural, and calling for a style of its own.

Stanislawski and his company visited some cities of Europe before the war, and again, with an extension to U.S.A., soon after the armistice. The Kamerny Theatre has followed them. The Habimah company, of Moscow, acting in Hebrew and making an impression by studied plastic expression, has toured Europe and America. None of these companies has ventured to London, which has the reputation of giving poor support to theatrical experiment. Even during the darkest days of the war, Max Reinhardt was supplied with funds wherewith to build the Grosses Spielhaus to which he transferred a type of production with which he had experimented in the Circus, Berlin. He produced here the *Oresteia* of Aeschylus, but he has had difficulty in finding subsequent productions fitted to the large scale of this building.

Gordon Craig obtained the workshops which he had been asking for, and he constructed a model stage at the Arena Goldoni, Florence, in 1913, but support was withdrawn on the outbreak of war and the work broken up. Claud Lovat Fraser, a student of Mr Craig's teaching, gained a popular success with his designs for a revival of *The Beggar's Opera*, under the direction of Nigel Playfair, at the Lyric Theatre, Hammersmith, London, in 1920. For this production, one scene was built and modified by changing light and symbol, as the action required. An earlier effort of this young artist upset the equanimity of those gathered at Stratford-on-Avon for a Shakespearean Festival. To-day Bridges Adams is encouraged to produce plays there after the same manner, and local eyes have become reconciled. Not only because of his talent in design, but because of his tact in humouring the difficult situations which arise in any attempt at innovation, the early death of Fraser was a loss to the cause of theatrical art in England.

In 1922 Mr Craig was invited to open an International Theatre Exhibition held in the Stedelijk Museum, Amsterdam. The designs for theatre construction, scenes, and costumes, many of which came from young America, showed how wide-spread is the interest in reconstructing the fabric through which the drama may speak. A section of the exhibition was devoted to books provoked by the quickening interest. The collection was subsequently seen at the Victoria and Albert Museum, London, and in municipal galleries in Manchester, Glasgow, and Bradford. Amongst the finest designs shown were those of Adolphe Appia, from Switzerland. Appia had made known his ideas on the art of the theatre in his book, *La Mise en Scène du Drame Wagnérien*, as long ago as 1895 (better known in the German edition of 1899, *Die Musik und die Inscenierung*). In 1923 he was invited to enter the great stronghold of the older conventions, La Scala, Milan, and he attempted to carry out some of his conceptions in a production

of *Tristano e Isotta* (Wagner). It proved to be a case of the fly responding to the invitation of the spider, or of pouring new wine into old bottles, and was a disappointing experience to a fine artist the nobility and beauty of whose designs is undeniable. It showed that a theatre must be of one mind before it can move forward. Appia works on terms of friendship with the Jacques Dalcroze School of Music, Geneva. Like Craig, he holds that the light in which the actor is seen in action may help the actor as it helps the work of a Rembrandt.

Many have now taken up the notion of 'painting with light' in the theatre. An economy of means is discerned from the point of view of the finance department, which sees that one man can work a switchboard and many hands be dispensed with.

The cinematograph has accustomed its patrons' eyes to a moving background of natural scenery which puts to shame the stage pretence of verisimilitude. Those stage electricians who take naturalism as their ideal have determined to rival if not to surpass the cinematograph film. A *cyclorama* (which is only a development of a panorama) is in use on many stages. A painted panoramic cloth, encircling two sides and the back of the stage, carried to a good height and trained on rollers, could be made to pass, for the length of the canvas, before the eyes of the spectators. Beerbohm Tree used such a moving background with his flying witches in *Macbeth*. Side-wings behind the proscenium arch could be dispensed with if desired, and also sky-borders, with the *battens* or lengths of light which they concealed. The cyclorama which is now succeeding this arrangement is in itself uncoloured. It is sometimes a fixture and sometimes removable. It is in some cases given a semi-domed roof. Various new ways of lighting this and the stage in general are now on the market, most of which can be seen in the new demonstration theatre at Magnet House, Kingsway, London. Early experiments in this direction were made at the Herkomer Theatre at Bushy. Mariano Fortuny, of Venice, had mastered his effects by 1907, and he installed his system at La Scala, Milan, 1920. An early article on the installation of the Royal Theatre, Stockholm, appeared in *The Graphic*, 9th July, and another on the Schwabe-Hasait system, a system of German origin, in *The Illustrated London News*, 27th August 1921. A Russian inventor, Samoiloff, was enabled to instal his system of producing changing effects of scene and costume at the London Hippodrome in September of the same year. These are inventions which electrical engineers offer to stage artists. It remains to be seen whether the artists will use them, and how they may be harmonised with the rest of the stage's mediums of expression, and in particular with the action of the actor.

At the invitation of the directors of the State Theatre, Copenhagen, Gordon Craig, who had avoided producing in a public theatre since his work in Moscow, collaborated with the actor, Johannes Poulsen, in the production of *The Pretenders* of Ibsen, 1926.

Henrik Ibsen, in explaining in 1884 his retirement from stage-direction and refusal to resume it, remarked that 'our theatre staff is demoralised, will not submit to discipline and yield absolute obedience; and, moreover, we have a press which is ever ready to support the refractory ones against the leader.' This is still true to-day. Journalists have misunderstood the aim, and have had no realisation of the difficulties of advancing theatrical art. Folly, doctor-like, continues to control skill. Disturbed fancy has seen in the new effort nothing but a danger to dramatic literature. Though tough writers like Bernard Shaw are obviously able to look after their rights, and have indeed made use of the aid of visual artists, journalists have ridiculously feared that playwrights needed protection, and have kept up a stream of obstructionist articles with such headings as *The Dramatist in Danger*. On the other hand, the effort to divine the basic principles of theatre art (which includes but is not included by the art of dramatic writing) numbers among its friends first-class writers and architects and the younger generation of theatre workers.

Licensing of Theatres.—Up to 1843 the only theatres entitled to act regular plays were those which held royal patents—in London, Drury Lane, Covent Garden, and the Haymarket (in summer)—but in that year Bulwer's Act (6 and 7 Vict. chap. 68) established practically free trade in theatricals. By it the Lord Chamberlain was made licensing authority in London and Westminster, Finsbury, Marylebone, Tower Hamlets, Lambeth, and Southwark. Outside his domains the power was vested in the justices of the peace. By the Local Government Act, 1888, the authority of the justices was transferred to the county councils, wherever such existed; but in a very great majority of cases these took advantage of a clause in the act which authorised them to delegate back to the justices their licensing powers. In London at present the licensing authority is divided between the Lord Chamberlain and the County Council. The conditions are from time to time altered by fresh enactments of Parliament.

See Amphitheatre, Art, Atellanæ, Basques, Drama, Fire, Masque, Mimes, Mysteries and Miracle-Plays, Opera, Pantomime; also R. C. Flickinger, *The Greek Theater and its Drama* (1918); Haigh, *Attic Theatre* (1889; new ed. 1907); E. K. Chambers, *The Mediæval Stage* (1903), *The Elizabethan Stage* (1924); K. Mantzius, *A History of Theatrical Art* (trans. 6 vols. 1903–21); Edward Gordon Craig, *On the Art of the Theatre* (1911; new ed. 1924), *Towards a New Theatre* (1912), *The Theatre Advancing* (1921), *Scene* (1923), *Books and Theatres* (1925), *The Mask*, a journal of theatrical art, founded 1908; Lily Bess Campbell, *Scenes and Machines on the English Stage during the Renaissance* (1923); Arthur Hornblow, *A History of the American Stage* (1925); Constantin Miclachevsky, *La Commedia dell' Arte* (1927); A. d'Ancona, *Origini del Teatro Italiano* (1891); Stedelijk Museum, Amsterdam, *Internationale Theater Tentoonstelling, Catalogus der Boekerij* (1922); Victoria and Albert Museum, London, *Catalogue and Bibliography* (1922); Vienna National Library, *Monumenta Scenica*, 12 sections (1924 *et seq.*); Walpole Society, *Designs by Inigo Jones* (1924); Jacques Rouché, *L'Art Théâtral Moderne* (1910; new ed. 1924); E. Maindron, *Marionettes et Guignols, les poupées agissantes et parlantes à travers les âges* (1900); O. Sayler, *The Russian Theatre under the Revolution* (1920; new ed. 1923); A. Jacovleff, *The Chinese Theatre* (1922); A. Miyamori, *The Masterpieces of Chikamatsu* (1926), with short valuable history of the Japanese Theatre; A. Coomaraswamy, *The Mirror of Gesture* (1917), giving Indian technique; E. Rose, *First Studies in Dramatic Art* (1926), giving theory of François Delsarte.

Théâtre Français, or Comédie Française. See Theatre, p. 68.

Thebes, the name of a celebrated Egyptian city, formerly the capital of Southern or Upper Egypt; called by the Hebrews No-Amon, by the Greeks Thebai, and at a later period Diospolis Magna. It lies in the broadest section of the valley of the Nile, in about 26° N. lat., at a spot where the desert on the west sheers away to the girdling range of the Libyan mountains, leaving a broad plain, partly cultivated, on which stand the famous twin statues, one of which is known as the 'vocal Memnon' (q.v.), and behind them the temples grouped about the modern districts of Kurna and Medînet-Habû. The Nile divides this western part or Necropolis of Thebes, anciently called the 'Libyan suburb,' from the extensive

ruins now known by the names of the villages Luxor (el-Uksur, 'the palaces') and Karnak which stand on the eastern bank, with the low range of the Arabian hills for a background. The traditional foundation of Thebes goes back to the 1st dynasty, but no buildings have hitherto been found earlier than the temple of Mentuhetep III. of the 11th dynasty, on the west bank of the Nile, and some remains, also of the 11th dynasty, on the east bank, apparently part of the original temple of the god Amon. Its most flourishing period was under the 18th, 19th, and 20th dynasties, or from about 1600 to 1100, when it had supplanted Memphis, the ancient capital of the Pharaohs. The central situation of Thebes secured it from the attacks of the northern enemies of Egypt, and contributed to its prosperity; and here the worship of Amon arose in all its splendour; magnificent palaces and temples were built in its different quarters by the great monarchs of the Theban dynasties, and were added to by later kings, down to the time of the Ptolemies and Antonines, to the 2d century A.D. It was enriched by the spoils of Asia and the tributes of Ethiopia, and its fame and reputation had reached the early Greeks. Homer describes it by the epithet of Hundred-gated (ἑκατομπύλαι Θῆβαι), doubtless in allusion to the gates or pylons of its temples, for Thebes was never a walled or fortified city. In the plenitude of its power it sent forth an army of 20,000 war-chariots; but about 1100 B.C. the Bubastite and Tanite dynasties removed the capital again to the north, to Sais and Memphis, and thenceforth Thebes declined in importance. At the Persian conquest in the 6th century B.C. Cambyses obtained a spoil of nearly £2,000,000 from the city, and destroyed many of its noblest monuments. The foundation of Alexandria still further injured it; and at the time of Strabo Thebes was only a cluster of small villages. Its temples, tombs, and ruins were frequently visited by Greek and Roman travellers, including the Emperor Hadrian. At a later period a considerable Christian population lived there under the empire; but at the Arab invasion the inhabitants fled to Esné. Thebes is now inhabited only by Fellahîn, by a few officials, and by the migratory visitors to the hotels at Luxor.

Of the monuments on the west or Libyan side the principal are the three temples of Seti I., Rameses II., and Rameses III., known respectively as El-Kurna, the Rameseum (or Memnonium), and Medînet-Habû. Close to the Rameseum is the fallen and broken colossus of the founder, the largest statue in Egypt, originally nearly 60 feet high, celebrated in Shelley's sonnet as that of Osymandyas, whose palace the temple was believed to represent. Near by are also some remains of two temples of Amenhotep III., whose two colossal statues still survey the green fields in front. Some way behind the Rameseum, on a spur of the hills, is the terraced temple of Queen Hatshepsut (18th dynasty), known as Deyr-el-Bahri, near which a remarkable series of thirty-nine royal and priestly mummies, papyri, &c., were found in 1881. At Medînet-Habû is a pile of buildings, of which the chief is the great temple of Rameses III., with sculptures representing his victories over the Philistines, the life in his harem, the riches of his treasury, and a calendar with inscriptions dated in the twelfth year of his reign. Near here, to the north-west, are the cemeteries of the sacred apes, and further on the Valley of the Tombs of the Queens, consisting of seventeen sepulchres, supposed to be the tombs of the Pallacides of Amen, mentioned by Diodorus and Strabo. Near them, among the hills, are the Bibân-el-Mulûk, or Tombs of the Kings of the 18th to 20th dynasties, sixteen in number, the most interesting of which are those of Tut-ankh-Amon, discovered by Lord Carnarvon and Mr Howard Carter; of Seti I., called Belzoni's, after its discoverer; and of Rameses III., named by Bruce the 'Harper's tomb.'

On the east bank the chief monuments are at Luxor, the beautiful temple of Amenhotep III. (18th dynasty), added to by Rameses II., with its well-known obelisk, the fellow of which was removed to the Place de la Concorde at Paris; and the still more magnificent temple, or rather group of temples, at Karnak, the sanctuary of which, built by Senusert I. of the 12th dynasty, was added to by the monarchs of the 18th. The most remarkable part of this wonderful mass of pylons, courts, and obelisks is the great hall, 170 feet by 329 feet, built in the 18th dynasty, and finished by Seti I. and Rameses II., with its central avenue of twelve massive columns, 62 feet high and 12 feet in diameter, and its 122 other columns, and two obelisks (originally four), one of which is the tallest in Egypt, 108 feet high. On the walls the sculptures tell the glorious history of the warrior kings of Egypt, how they fought against the Hittites, the Rutennu, the Syrians, and the people of the Euphrates valley, and took from them their strong cities. Here, too, is the so-called Portico of the Bubastites, built by Shishak I., recording his expedition against Jerusalem, 971 B.C.

The Thebaid, the territory of Thebes, was a term applied to various areas at various times, but generally to one of the three main divisions of Egypt. It is specially familiar to us as being a favourite place of retreat for Christian hermits.

Thebes, the principal city of Bœotia in ancient Greece, situated on the slopes of Mount Teumessus, and between two streams, the Dirce and the Ismenus, about 44 miles to the north-west of Athens. Its acropolis continued to be called Cadmeia from the legend that it was founded by a colony of Phœnicians under Cadmus. Here were born Dionysus and Herakles, Tiresias and Amphion; this was the scene of the dark tragedy of Œdipus, the war of the Seven against Thebes (see ADRASTUS), the terrible vengeance of the Epigoni. But the story of the city enters the world of history in the dispute between Thebes and another Bœotian city, Platæa, which involved the former in an unsuccessful war with Athens, and began that bitter enmity that never died out till the death of Greek liberty itself. During the Persian war Thebes sided with the Asiatic invader, but Sparta, jealous of Athens, interfered to restore Theban supremacy over the other Bœotian cities. When the Peloponnesian war broke out Thebes took part with Sparta, and at its close was eager for the destruction of Athens; but it soon began to dread the overgrown power of its ally, and sheltered the Athenian exiles from the rule of the Thirty Tyrants. Hence arose a bitter antagonism between Thebes and Sparta, and a varying struggle, which closed with a short period of Theban supremacy over all Greece, won by the glorious victory of Epaminondas at Leuctra (371), but ended by the hero's death in the moment of victory at Mantinea (362). The eloquence of Demosthenes induced Thebes to unite in opposition to the encroachments of Philip of Macedon; but it was too late, and in 338 B.C. the battle of Chæronea crushed the liberties of Greece. After Philip's death the Thebans made a fierce but unsuccessful effort to regain their freedom, but their city was taken by Alexander, levelled to the ground, and the entire population sold into slavery (336). In 316 it was rebuilt by Cassander (whose walls were traced by E. Fabricius in 1888); and it was taken by Demetrius Poliorcetes in 290. It was plundered by Sulla, and in Strabo's time was a miserable village. During the 11th and 12th

centuries it revived through its silk manufacture, but under the Turks again declined, though its modern representative, Thiva, has still a population of about 4000. See E. Fabricius, *Theben* (1891).

Thecla, a virgin saint of the early church, a member of a noble family of Iconium in Lycaonia, where she was converted by the preaching of St Paul, and, having devoted herself to a life of virginity, suffered a series of persecutions from her intended bridegroom, as well as from her parents. She is said to have died at the age of ninety in Seleucia. The apocryphal *Acts of Paul and Thecla* were edited by Tischendorf in the *Acta Apostolorum Apocrypha* (Leip. 1851). See Lipsius on the Apocryphal Acts (Brunswick, 1886), the monograph by Schlau (Leip. 1877) and Holzey, *Die Theklaakten* (Munich, 1905).

Theed, WILLIAM (1804–91), sculptor, (son of William Theed, R.A., sculptor, 1764–1817), is known by the statues of Newton at Grantham, Lord Derby at Liverpool, Peel at Huddersfield, and the Africa group on the Albert Memorial.

Theft is the unlawful taking away of another man's property. To constitute the crime three things are necessary—the *animus furandi*, or intent to steal, the *asportavit*, that is, the goods must be removed from the owner's possession, and this must be done *domino invito*, against his will. The thing stolen need not be in the possession of the owner; thus, if a man finds lost property, and, knowing to whom it belongs, converts it to his own use, he is guilty of the offence. Again, if a man receives an article for a special and temporary purpose and appropriates it he commits theft. A guest at an inn making off with the vessels or plate brought to him during a meal is an example. Again, the owner may be induced to part with the property by a false pretence; this would be theft according as he did not or did intend to transfer the right to the goods. Thus, if A got from B a horse on the pretext that he wished to show it to a possible customer, A would be guilty of theft if he kept the animal; but if he obtained possession by representing that he wanted it for himself and would pay for it next day, a payment he could not and did not intend to make, he would be guilty of obtaining goods by false pretences. Both parties may in the first instance be deceived or mistaken, but the subsequent conduct of one may make him a thief. Thus, A agreed to lend B a shilling; the coin that passed was a sovereign. B finding this out later kept it; after some doubt he was found guilty of theft. If an article is pledged it is theft if either of the two parties to the contract take possession of it to the detriment of the other; so the partner of a firm or the member of a corporation may steal the partnership or corporation property, but a married woman living with her husband does not commit theft when she converts his property to her own use. If the theft be from the person, and accompanied by violence or threats, it is robbery; if committed by a clerk or servant, upon property received by him on account of his master, it is embezzlement. To buy or accept, knowingly, stolen goods is not theft, but receiving—a crime punishable with fourteen years' penal servitude or less, according to the nature of the theft. The following cannot be stolen: Land and things permanently attached thereto; running or standing water not stored for use (gas and electricity may be stolen); animals running wild, corpses, and things abandoned by their owners. Child-stealing, viz. the abduction of children under the age of puberty, is an offence, but as committed against the person is not properly theft. In England formerly theft was either *grand* or *petit* larceny. The latter was restricted to the taking of property to the value of one shilling or less. If the value was greater it was the former, and was punishable between the time of Edward I. and 1827 with death. Very severe sentences may still be inflicted for various kinds of theft. Thus, to steal a will or a letter in the custody of the post-office is punishable with penal servitude for life.

See Stephen's *Digest*, *General View*, and *History of the Criminal Law*. See also STOLEN GOODS.

Theine. See CAFFEINE, TEA.

Theism (Gr. *theos*, 'God'), etymologically equivalent to belief in a god or gods, and as such opposed to Atheism (q.v.), is now usually understood to mean the doctrine of the one, supreme, personal God, 'in whom we live, and move, and have our being'—as distinguished from polytheism, which recognises more gods than one; from Pantheism (q.v.), which denies the divine personality; from Agnosticism (q.v.), which denies that we can know anything of God; and from Deism (q.v.), which, etymologically equivalent to Theism, is generally defined as recognising the personality of God, but denying his providence and active presence in the life of the world (though it should be remembered that many deists would not have admitted that this was their doctrine). Deism further explicitly rejects revelation and trinitarian conceptions of the godhead, while Theism may or may not accept these doctrines. But the term theism was often used as equivalent to deism with its negative postulates: and when the Brahma Samâj is called the 'Theistic Church of India,' or a book is published with such a title as *Theistic Devotions*, that kind of theism is also meant which either denies or at least does not include Trinity, incarnation, inspired and infallible revelation, or miracle.

Various views of the origin of the notion of God, and the relation of the monotheistic religions to nature-worship, animism, spiritism, and polytheism, have been indicated in the article Religion (q.v.); together with several definitions of religion as man's attitude towards God.

Theism as the doctrine of the nature and attributes of God covers a large part of the field of theology and speculative philosophy. But in practice it is usually restricted to the maintenance of the thesis that God may be known; the history of the origin and development of the idea of God; and the statement, criticism, and defence of the arguments for the existence of God. The main part of its work is apologetic, in opposition to the hostile systems and theories, rather than a scheme of systematic Theology (q.v.). No competent apologist now stakes the existence of God on any one argument, or exhibits the proof as a series of syllogisms. It is rather maintained that the study of human history, of human nature especially on its moral and spiritual side, and of the world as far as science reveals it to us make for the existence of a God, demand such a postulate as the key to the universe, and render the belief in a personal God greatly more probable than any other thesis—a subject vastly too wide for discussion here. But it is necessary to name what are often referred to as the four great arguments for the existence of God. (1) The *ontological* argument first formulated by St Anselm proceeds from the notion of a most perfect being to infer his existence; without actual existence the idea would fall short of perfection. The argument was re-stated in a different shape by Descartes (q.v.) and by Samuel Clarke, and, though very contemptuously treated by Kant, is still an element of the argument that without a God the world is a chaos.

(2) The *cosmological* argument, employed by Aristotle, Aquinas, and a host of Christian authors, is an application of the principle of Causality

(q.v.). We cannot conceive an infinite regression of finite causes; therefore beyond the last or first of the finite causes is the Infinite. From motion the argument is to a mover.

(3) The *teleological* argument, or argument from design, proceeds from the order and arrangement of the universe, the reign of law and beauty and adaptation, to the intelligent and supreme fountain of order. This is the most familiar of the arguments, especially on the lines laid down by Paley.

(4) The *moral* argument was that relied on by Kant (q.v.) when he destructively criticised the other three, and forms a part of most modern theistic arguments. God is a postulate of our moral nature; and the moral law in us implies a lawgiver without us.

See, besides general works on apologetics and dogmatic theology, Professor Flint's *Theism* (1877; 4th ed. revised, 1889); Harris, *The Philosophical Basis of Theism* (New York, 1883); *The Grounds of Theistic and Christian Belief* (New York, 1883); the Duke of Argyll, *The Reign of Law* (1866); Kant's *Critique of Pure Reason;* Mill's *Three Essays;* Janet's *Final Causes* (trans. 1878); J. T. Merz, *History of European Thought in the 19th Century* (4 vols. 1896–1914); and the Gifford Lectures (1888 *et seq.*).

Theiss (Hun. *Tisza;* Serb. *Tisa*), an important affluent of the Danube, and the chief river of east Hungary, rises by two streams, the Black Theiss and the White Theiss, in the Carpathian Mountains. It winds 750 miles north-west, south-west, and finally southward, joining the Danube in Yugoslavia after running parallel to it for 300 miles. The Theiss, itself navigable for steamers during the last 200 miles of its course, has several large and navigable affluents, as the Maros and Bodrog. The lower part of its course is sluggish, and it has often inundated the plains, flooding the cities on its banks, such as Szegedin (q.v.). Much has been done to regulate the course and drain the marshes on its banks. The Theiss is extraordinarily rich in fish.

Thellusson, PETER, the son of Isaac de Thellusson, ambassador of Geneva at the court of Louis XV., was born in Paris, 27th June 1737, and settling in London as a merchant in 1762, acquired enormous wealth, which at his death (27th July 1797) he disposed of by a will that led to a special act of parliament and much litigation. After bequeathing large fortunes to all the members of his family, he left the residue of his wealth (estates worth £4500 a year and personal property to the amount of £600,000) to trustees, to accumulate during the lives of his three sons and of all their sons. The accumulated fund (estimated to be likely to produce some £19,000,000) was then to be used to purchase estates for the eldest lineal descendants of his three sons. The will was contested by the heirs at law, but affirmed in the House of Lords in 1805; though meanwhile the Thellusson Act (see PERPETUITY) had been passed (1800), restraining testators from devising their property for accumulation for more than twenty-one years. Thellusson's last grandson died in 1856; and there was then a lawsuit as to the interpretation of the will. It was finally adjudged on appeal to the House of Lords in 1859 to Lord Rendlesham and a grandson of Peter's third son; but by reason of expenses the sum inherited did not much exceed the original bequest.

Thelwall, JOHN (1764–1834), son of a London silk-mercer, forsook his father's business, tailoring, and law for literary work, publishing poems and editing a magazine. In 1790 he joined the 'Friends of the People,' supported Horne Tooke (q.v.), and with him was tried in 1794 and acquitted. He published more poems, lectured on Roman history, and became an authority on elocution, the cure of defects of utterance, and English metre, as well as on social and political reform. See Life by his widow (1837) and C. Cestre (1906); also Hobhouse's *Liberalism* (1911).

Thelygonum, a genus consisting of one species, puzzling in its affinities, which has been made a family by itself (Thelygonaceæ or Cynocrambaceæ). *T. Cynocrambe* is a small edible herb growing on rocks and old walls in the Mediterranean region as far east as Persia. Opposite-leaved below, it becomes sympodial, with alternate leaves above, each leaf in this part having a group of male flowers opposite it, and in its axil the continuation shoot and another bearing female flowers.

Themis, daughter of Uranus and Gē, bore to Zeus the Horæ—Eunomia ('Equity'), Dikē ('Justice') and Eirēnē ('Peace'); also the Moirai or Fates. She was regarded as the personification of order and justice, and in art Themis holds a cornucopia and a pair of scales.

Themistocles, the great Athenian general and statesman, was born about 520 B.C. His father, Neocles, belonged to an undistinguished family of the middle class; his mother was a Carian. Ambitious from his cradle, he used his archonship of 493 for the promotion of his political plans. He saw what was best for Athens when he turned the attention of his countrymen to the sea and convinced them that a powerful fleet was absolutely necessary for their welfare. A large sum of money, the produce of the silver-mines of Laurium, which it was proposed to divide among the people, was devoted to its construction. During the war with Persia which followed Themistocles, commander of the Athenian squadron, which numbered 200 of the 324 vessels engaged, to avoid dissension was content to serve under the Spartan Eurybiades, a man of narrow mind and hopeless obstinacy. On the eve of Salamis it required all the influence of Themistocles' vehement personality and threats to induce his timid superior and colleagues to await the attack of the enemy. In his eagerness to precipitate a collision, he sent by night a messenger to urge the Persian generals to make an immediate attack, as the Greeks had resolved on retreat. He thus provided for himself, whatever the issue might be. Intimation of the Persian advance was brought at nightfall by his rival Aristides, who had been ostracised in 483 B.C. The Peloponnesians refused to continue the pursuit of the Persians beyond Andros. From that place Themistocles sent a second message to Xerxes urging him to hasten back before the Greeks carried out their project of breaking down the bridges. Though later Themistocles may have found it convenient to interpret this act differently, it was honestly sent at the time with the intention of inducing Xerxes to leave Attica. The victor of Salamis was now the foremost name in the minds and mouths of men. The rebuilding of the walls of Athens by his advice on a scale far larger than anything in existence aroused great uneasiness among the allies of Sparta, but, by a series of adroit stratagems, Themistocles succeeded in cajoling the ephors till the walls had reached a height sufficient for defence. But his popularity was now waning, and the Spartan faction in Athens was plotting his ruin. Plutarch tells us that he provoked the anger and resentment of the citizens by his insufferable arrogance. In or about 471 B.C. ostracism was demanded, and he was banished from Athens. Argos was his first retreat, but so long as he remained there Sparta could have no security or peace. His condemnation on the charge of implication in the treason of Pausanias drove him from Argos. He fled to Corcyra, and after a series of hairbreadth escapes was compelled

to seek shelter in Asia. Artaxerxes received his suppliant with the greatest favour, and listened with attention to his schemes for the subjugation of Greece. It is said that the young king was so affected with joy that he was heard at night to cry thrice in his dreams, 'Themistocles the Athenian is mine.' After the Persian fashion, the town of Lampsacus was appointed to supply him with wine, Magnesia with bread, and Myus with other provisions. At Magnesia he lived securely till about 450 B.C.

'In a word,' says Thucydides, 'Themistocles, by natural force of mind and with the least preparation, was of all men the best able to extemporise the right thing to be done.' Of his moral character the great historian says nothing. But if his patriotism seems at times to have been but a larger kind of selfishness, it must be remembered that Themistocles was possessed of the conviction that no one could realise the dream of a great Athenian empire but himself. The sentence passed upon him, due to Spartan jealousy, was a bitter return for the unparalleled services he had rendered his country. Whether he ever intended to carry out his promises to the Persians is questioned.

See the histories of Greece by Grote, Abbot (1892), Bury (1902), Stobart (1912); *Cambridge Ancient History*, iv. and v. (1926–27).

Thénard, LOUIS JACQUES (1777–1857), French chemist, was born at Louptière, studied pharmacy at Paris, became professor of chemistry at the Collège de France, the École Polytechnique, and the Faculté des Sciences, and was subsequently ennobled. He carried out numerous researches, discovered hydrogen peroxide (1818), and wrote *Traité de Chimie élémentaire, théorique et pratique* (4 vols. 1813–16).

Theobald, LEWIS, an early Shakespearian critic, was born about 1688, the son of an attorney at Sittingbourne in Kent, and was bred to his father's business, but early took to literature, publishing in 1714 a tragedy entitled *Electra*, followed by twenty equally forgotten dramas. He published thirty papers under the name of 'Censor' in *Mist's Journal* (1715), and eighteen months later commenced the *Censor* as a separate tri-weekly paper, which extended to sixty-six more numbers. In 1726 he published his pamphlet, *Shakspere Restored, or a Specimen of the many Errors committed as well as unamended by Mr Pope in his late edition of this poet*, which the poet repaid by immortalising him as the original hero of the *Dunciad*. Theobald could not compete with his adversary in wit, but he proved himself a much more competent editor of Shakespeare by his edition in 1733 (7 vols.), which quite extinguished that of his rival. He died in September 1744. Theobald was often very happy in his suggested emendations, and had much higher respect for his text than many much more brilliant men. See Churton Collins, *Essays and Studies* (1895), and a study by R. F. Jones (1919).

Theobalds, in Hertfordshire, near Waltham Cross, 13 miles N. of London, a mansion built about 1560 by Lord Burghley, who here often entertained Elizabeth. Exchanged for Hatfield (q.v.) in 1607 by his son the Earl of Salisbury with James I., whose favourite residence it was, and who died here, it was demolished in 1650 and 1762. The present Theobalds Park, on the other side of the New River, is an 18th-century mansion, the seat of the Meux family. Here Temple Bar (q.v.) was re-erected in 1878.

Theobroma, Theobromine. See COCOA.

Theocracy, literally, 'government by God,' is the name given to that constitution of a state in which the Almighty is regarded as the sole sovereign, and the laws of the realm as divine commands rather than human ordinances. Under such a view the priesthood necessarily become the promulgators and interpreters of the 'divine commands,' and act as the officers of the invisible Ruler. The typical example of a theocracy is that established by Moses among the Hebrews.

Theocritus, the pastoral poet of Greece, was born about the close of the 4th century B.C., most probably in Syracuse. What we know of his life is largely a matter of conjecture and inference from his own works. He was educated at Cos under Philetas, a poet and critic then famous, of whom Theocritus speaks with high respect (Id. vi.). Theocritus repeatedly mentions, either by their own or by disguised names, friends of his own, who seem to have formed a literary coterie in Cos; such were Nikias, Asclepiades, Alexander, Leonidas, and others. From Cos he probably returned to Sicily, where he spent a number of years. About 275 he seems to have repaired to the court of Ptolemy Philadelphus in Alexandria. There he resided a few years—perhaps till about 270 B.C.—thereafter returning to Cos. Whether he died there or at Syracuse it is impossible to say. In his pastoral poems Theocritus struck out an entirely new form of literature, which lives and is fresh for ever. Many of the poems which Suidas attributes to him are lost, and those which we have appear to be a selection from his writings. There is some question as to the authenticity of some of the thirty poems which we have. Reasoning both from external and internal evidence, modern scholarship has rejected some half-dozen or more of them, viz. xix., xx., xxi., xxiii., xxv., xxvii., xxxi., and the *Megara* (an anonymous poem on the wife of Herakles), though the evidence is not convincing for xxv. and the *Megara*. His poems fall under several classes—half-epic or epic-idyll, mimic, idyllic or pastoral, and lyric; there are also a number of epigrams or 'inscriptions.' The form of poetry most popular in Theocritus's day was the epic, as the *Alexandra* of Lycophron and the *Argonautica* of Apollonius Rhodius, both contemporaries of his, survive to show us. Theocritus shows himself influenced to some extent by the tendency of the time in his series of poems dealing with heroic legend, the infant Hercules and the snakes, Hercules at the stables of Augeas, his encounter with the Nemean lion, the episode of the Argonautic expedition when Hercules lost his young squire Hylas, and that of the fight between the Greek hero, Polydeuces (a kinsman of Hercules), and the barbarian giant who is defeated in boxing, and made to promise to respect the rites of hospitality for the future; the combat is described with the utmost spirit. These poems are full of the spirit of Greek chivalry, and show Theocritus to be a Hellene at heart. Of the other poems, Idylls ii., xiv., and xv. are dramatic scenes, and have been called mimic because they closely resemble in form the mimes of the Syracusan poet Sophron (Plato's favourite author), who wrote with great dramatic power dialogues probably in rhythmical prose, with male and female characters. Theocritus's famous Idyll xv., *The Ladies of Syracuse*, is said to be copied from Sophron. It describes the visit of a Syracusan lady and her friend, both living in Alexandria, to the festival of Adonis. Nothing could be more natural than this poem. Lang says truly, 'the chatter of the women has changed no more in 2000 years than the song of birds.' A graceful lyrical strain is heard in xxviii., xxix., xxx.; the first accompanies a gift of an ivory distaff to the wife of his friend Nikias; the others are love-poems.

The Doric settlers in Sicily delighted in poetry resembling the ballads, love-songs, and dirges, and the improvised poems in answering couplets which are still sung in Sicily and in Southern Italy.

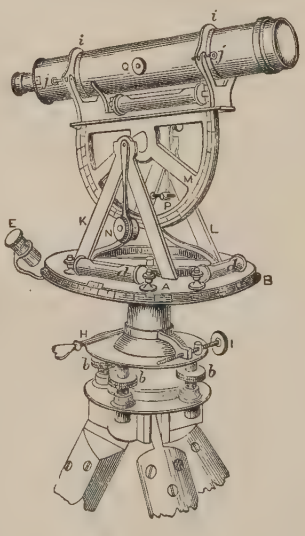
Theocritus raised this rude pastoral poetry into a new and perfect form of literature. His short poems dealing with pastoral subjects, and, like paintings, representing a single scene, came to be called Idylls (*eidullia*) or 'little pictures,' a name probably not used by Theocritus himself. He has had many imitators, but in their hands the pastoral has degenerated; they have used rural scenery merely as stage machinery, whereas Theocritus writes of the country because he loves it. His countrymen are not mere lay-figures dressed up with crook in hand. They are genuine country-folks, and show that combination of simplicity and love of nature with shrewdness in making a bargain which is found in the peasant everywhere. Every touch in these poems is natural and lifelike. After reading Theocritus the *Eclogues* of Virgil strike us as artificial. Take, for instance, the *Journey to the Feast*, which tells how the poet and two friends took their way from Syracuse to join a harvest-home party. On the road they overtake Lycidas, a goat-herd. To beguile the way Lycidas and Theocritus recite short poems of their own composition. Keats has written nothing more luscious than the description of the orchard-nook where the feast is held, which concludes the poem: verses which exhale the very mellowness and scent of summer. 'All things breathed the rich scent of summer, the scent of the time of ripe fruits.' Strange power is shown in the idyll on the love of Polyphemus the Cyclops for Galatea. Nothing could seem further from love than the Cyclops, yet Theocritus makes us feel for the monster and pity him in the humility of his love and his hopeless passion. Hardly anywhere is there truer pathos than this poem contains. One of Theocritus's greatest charms is his power of landscape-painting. His landscapes bask in full sunlight. Kingsley says truly, 'Theocritus floods the whole scene with the gorgeous Sicilian air like one of Titian's pictures.' When Theocritus lived, Greek national life had ceased to be; imperial Athens was no longer; Greek religion had lost its vitality. No poet of Pericles's day could have written the fulsome eulogy on Ptolemy's repulsive marriage in the xvii. Idyll. Had Theocritus lived in the age of Pericles, no doubt a stronger and more bracing air would have blown through his Arcadia, which remains for us a country good to wander in, a sunny realm where men labour without care, and where life is undisturbed by anxious questionings. Dealing with pastoral life, Theocritus comes most into comparison with Robert Burns, who has far more depth, humour, and passion, but is without Theocritus's sense of beauty. Compared with the Scottish poet, Theocritus stands out at once as the man not only of genius but also of highest culture, accustomed to refined city ways, while the *comparative* roughness of Burns shows him as the man born and bred from earliest years in the 'pastoral world far from city and mart.' The power of Theocritus is seen in his influence over other poets. Virgil imitates him closely in his *Eclogues*. Tennyson was deeply influenced by him: poems like *Œnone* and the idylls of country life remind us both in form and spirit of the Greek poet.

There are editions by Ahrens (1855), Meineke (1856), Fritzsche (1857 and 1869), Wordsworth (2d ed. 1877), Ziegler (1879), and R. J. Cholmeley (1901 and 1919), Wilamowitz-Möllendorff (Oxford, 1907); verse translations by Chapman (1866), Calverley (1869), J. H. Hallard (1894; 4th ed. 1924), and R. C. Trevelyan (1925). Idylls vii. and xi. were exquisitely translated by Leigh Hunt (*Jar of Honey*). And there is a prose translation by Andrew Lang (1889), and another in an edition by J. M. Edmonds (1912).

Theodectes, a Greek tragedian of the 4th century B.C., wrote fifty tragedies, of which some fragments survive, and a treatise on rhetoric, now lost.

Theodicy (Gr. *theos*, 'God,' and *dikē*, 'justice'), a name given to the exposition of the theory of Divine Providence, with a view especially to the vindication of the attributes, and particularly of the sanctity and justice of God in establishing the present order of things, in which evil, moral as well as physical, so largely appears to prevail. The name is of modern origin, dating from the close of the 17th century, or the beginning of the 18th; but the theory, as well as the mysterious problem which it is meant to resolve, is as old as philosophy itself (see EVIL). The first to consider the question in its integrity was the celebrated Leibniz (q.v.); and see OPTIMISM.

Theodolite, an instrument much employed in land-surveying for the measurement of angles horizontal and vertical, is neither more nor less than an altitude and azimuth instrument, proportioned and constructed so as to be conveniently portable. As in all instruments in very general use, the variations in its construction are almost numberless; but its main characteristics continue unaltered in all forms. It consists essentially of two concentric circular plates of copper, brass, or other material (the upper plate, or *upper horizontal*, either being smaller, and let into the lower, or *lower horizontal*, or the rim of the lower raised round the outside of the upper), moving round a common axis, which, being double, admits of one plate moving independently of the other. Upon the upper horizontal rise two supports, bearing a cross bar, which is the axis of a *vertical circle* moving in a plane at right angles to the former. This latter circle either has a telescope fixed concentric with itself, or a semicircle is substituted for the circle, and the telescope is laid above and parallel to its diameter. The circles, as their names denote, are employed in the measurement of horizontal and vertical angles. For these purposes the outer of the horizontal circles is graduated, and the inner carries the index-point and the verniers (see VERNIER): the vertical circle is also graduated, and the graduations are generally read off by an index-point and vernier firmly attached to the supports. The upper horizontal is furnished with two levels placed at right angles to each other, for purposes of adjustment, and has a compass-box let into it at its centre. The stand



Theodolite:
A, B, the horizontal limbs; *d*, *d*, spirit levels; E, a magnifier to read off the degrees; *b*, *b*, *b*, milled screws to adjust the instrument, and set in level; H, a clamping screw; I, a slow-motion screw, by which the instrument is moved more exactly than could be done by the hand; *i*, *i*, clips, to reverse the telescope by screws, *j*, *j*; K, L, frames into which the pivots are placed, on which the vertical arc, M, is turned round, and on which the telescope is fixed; N, a microscope for reading off the degrees; P, a slow-motion screw, by which the vertical arc and telescope are moved; Q, a milled screw for moving the object-glass of the telescope.

consists of a circular plate supported on three legs, and connected with the lower horizontal by means of a ball-and-socket joint; the horizontal adjustment of the instrument being effected by means of three or four (the latter number is the better) upright screws placed at equal distances between the plates. The telescope is so fixed as to be reversible, and the adjustments are in great part similar to those of other telescopic instruments, but are too numerous and minute to be here detailed. Both horizontal plates being made, by means of the screws and levels, truly level, the telescope is pointed at one object, and the horizontal angles read off; it is then turned to another object, and the readings-off from the graduated circle again performed; and by the difference of the readings, the angular horizontal deviation is given; and when vertical angles are required, the readings are taken from the vertical circle in a similar manner. For the much-disputed but unknown etymology, see the note in the *New English Dictionary*.

Theodora, the famous consort of the Byzantine emperor Justinian I., was, according to the dubious evidence of Procopius, the daughter of Acacius, a bear-ward at Constantinople, and had already been by turns actress, dancer, and shameless harlot, when she won the heart of the austere and ambitious Justinian, to become in succession his mistress, his wife, and the sharer of his throne (527). There was a law which forbade a member of the senate to marry an actress, but Justinian cleared the way by repealing it. Theodora was of less than middle height, and her complexion was pale, but such was her beauty that Procopius tells us 'it was impossible for mere man to describe her comeliness in words, or imitate it in art.' Never thereafter did the breath of scandal touch her name; she became Justinian's trustiest counsellor, bore a chief share in the work of government, and saved the throne by her high courage at the crisis of the Nika riots (532). 'Now every man must die once,' said she in council, 'and for a king death is better than dethronement and exile. . . . If you wish, O emperor, to save your life, nothing is easier: there are your ships and the sea. But I agree with the old saying that "empire is the best winding-sheet."' She lavished her bounty on the poor, and especially upon the unfortunate of her own sex, and died at forty (548), her slender and graceful frame worn out by the anxieties of state. Her character descended to history unspotted until the appearance (1623) of the *Secret History* of Procopius, the work of a man who had enjoyed the full favour and confidence of the court, and had in his other writings openly extolled the triumphs and the wisdom of Justinian and Theodora, whose reputation he was the while labouring in secret to destroy. His stories satisfied his first editor, Nicholas Alemannus, and later Gibbon and Dahn; but it may be remembered that there is not a word of Theodora's profligacy in Evagrius or Zonaras, and moreover that, when a man owns that elsewhere he has purposely denied or concealed the truth, it may at least be said that we are entitled to hesitate about the value of his testimony at all.

See the article JUSTINIAN I.; also Antonin Débidour, *L'Impératrice Théodora* (Paris, 1885); C. E. Mallet's article in *Eng. Hist. Rev.* (vol. ii. 1887); F. Dahn, *Prokopius von Cäsarea* (Berlin, 1865); Bury, *Later Roman Empire* (1889); Holmes, *Age of Justinian and Theodora* (1905-7); Diehl, *Byzantine Portraits* (trans. 1927).

Theodore OF MOPSUESTIA, a great exegete of the early church, was born at Antioch about the middle of the 4th century. He was the friend of Chrysostom and the pupil of Libanius, but it was Diodorus of Tarsus from whom he imbibed his zeal for biblical studies. About the year 383 he became a presbyter in Antioch, and about 392 he was chosen Bishop of Mopsuestia in Cilicia. Theodore, very probably the teacher of Nestorius, died at peace with all men in 428 or 429. Theodore wrote commentaries on almost all the books of Scripture, of which only remain, in the Greek, that on the Minor Prophets; in Latin translations, those on the lesser epistles of Paul, besides many fragments, especially on the epistle to the Romans. As an exegete he eschews the allegorical method, adopting the literal meaning, and he takes into consideration also the historical circumstances of the composition, and assumes varying degrees of inspiration. When the Nestorian controversy broke out his polemical writings, which seem to have offended by a characteristically sober tone, were attacked, and after a century of fanatical agitation were formally condemned by Justinian in the *Tria Capitula* (544). The fifth œcumenical council—that of Constantinople in 553—confirmed the emperor's condemnation, and Theodore's name vanished from the list of orthodox writers.

Theodore's works were included by Migne in the Greek series of his *Patrologia* (lxvi.). The Greek fragments of his New Testament commentaries were collected by Fritzsche (1847). The Pauline commentaries were edited by Swete, with admirable prolegomena (Camb. 1880–82). The commentary on the Minor Prophets was edited by Wegnern (1834) and Mai (1832, 1854), the Syriac remains by Sachau (1869). See Kihn, *Theod. von Mopsuestia u. Junilius Afric., als Exegeten* (Freib. 1880); L. Patterson, *Theodore of Mopsuestia and Modern Thought* (1927).

Theodore OF STUDIUM, Greek theologian, born in 759 at Constantinople, became forty years later the head of the Studium monastery at that city. A stout supporter of image-worship, Theodore was banished several times for his views, and died in proscription on the peninsula of Tryphon in 826. He was subsequently canonised. His writings include some 550 letters, the *Catechesis Magna* and *Catechesis Parva*, polemics, epigrams, and hymns. See A. Gardner, *Theodore of Studium: his Life and Times* (1905).

Theodore OF TARSUS, seventh archbishop of Canterbury, was born about 602 A.D. at Tarsus in Cilicia, and studied at Athens. Consecrated in 668 by Pope Vitalian to the primacy of the English church, Theodore set off for Canterbury and arrived there exactly a year later (May 669), having been delayed in France. The task before him was no light one for a man already advanced in years. A tour of his province revealed a church without unity or organisation; the dioceses corresponding to the various kingdoms were too large, and many sees stood empty. Theodore began by filling the vacant sees wherever possible, and in 673 called at Hertford the first national synod of the church, which accepted articles of guidance propounded by him, and determined upon annual synods to be held thereafter at Clovesho. Although Theodore's proposal to divide the overlarge dioceses did not meet with the approval of the assembly, many of his remaining years were devoted to this great task. His summary treatment of Wilfrid (q.v.), the bishop of Northumbria, whose diocese he quartered, occasioned the famous quarrel between the two, which lasted a number of years. Theodore died on the 19th September 690, and was buried at St Augustine's Abbey, Canterbury. He was no saint in the ordinary sense, and he was more than an ecclesiastical statesman. 'It is difficult,' writes Stubbs, 'if not impossible, to overstate the debt which England, Europe, and Christian civilisation owe to the work of Theodore. He was the real organiser of the administrative system of the English church, and in that work laid the founda-

tion of English national unity.' The synod of the church in 673 was, indeed, a pattern for the later witanagemots and parliaments. To practical genius Theodore added an accomplished scholarship, and under his direction Canterbury became an important centre of culture. His *Penitential* was first edited in its accepted form by Wasserschleben (Halle, 1851).

See Bede, *Historia Ecclesiastica* (ed. Plummer, 1896); Hadden and Stubbs, *Councils and Ecclesiastical Documents*, iii. (1871); Stubbs, 'Theodorus' in the *Dictionary of Christian Biography* (1887); Bright, *Early English Church History* (3d ed. 1897); Browne, *Theodore and Wilfrid* (1897).

Theodore, 'king of Corsica,' otherwise Baron Theodor von Neuhoff, son of a Westphalian noble in the French service, was born at Metz in 1686, was himself successively in the French, Swedish, and Spanish service, was ruined in Law's speculations, and after leading an adventurer's life settled at Florence in 1732. Thrice he headed Corsican risings against the Genoese and was indeed crowned Theodore I. in 1736. But each time he was driven to flight, and after many wanderings he settled in London in 1749, and died there 11th December 1756. In Spain he had married an Irish lady, daughter of the Earl of Kilmallock. His only son by her, known as Colonel Frederick, wrote a book on Corsica, and at the age of about seventy-two shot himself in the porch of Westminster Abbey, 1st February 1797. See Fitzgerald, *King Theodore of Corsica* (1890).

Theodore. See ABYSSINIA.

Theodoret, church historian, was born at Antioch about 390, early entered a monastery, and in 423 became Bishop of Cyrus, a city of Syria. Here he laboured with the utmost zeal, and he himself claims to have converted over a thousand Marcionites. As a foremost representative of the school of Antioch he became deeply involved in the great Nestorian and Eutychian controversies, and was finally deposed by the celebrated Robber-council of Ephesus in 449. This was reversed by the general council of Chalcedon in 451, but Theodoret did not long survive his restoration, dying about 457.

His works were edited by Schulze and Nösselt (Halle, 1769-74), and consist of commentaries on Canticles, the Prophets, Psalms, and the whole of St Paul's Epistles; a *History of the Church*, from 325 to 429 A.D., in five books, ed. by T. Gaisford (1854), trans., with Evagrius (1851); *Religious History*, being the lives of the so-called Fathers of the Desert, a series of most curious and interesting pictures of early ascetic life; the *Eranistes*, a dialogue against Eutychianism; *A Concise History of Heresies*, together with orations and nearly 200 letters. See Binder, *Études sur Théodoret* (Geneva, 1844); Specht, *Theodor von Mopsuestia und Theodoret von Cyrus* (Mun. 1871); Roos, *De Theodoreto Clementis et Eusebii compilatore* (Halle, 1883); A. Bertram, *Theodoreti Doctrina Christologica* (Hildesheim, 1883); and Güldenpenning, *Die Kirchengeschichte des Theodoret von Kyrrhos* (Halle, 1889).

Theodoric, or THEODERIC (455–526 A.D.), surnamed THE GREAT, was the founder of the Ostrogothic monarchy. The history of his reign (from 474) is given at GOTHS, p. 329. He was buried in a magnificent tomb at Ravenna. 'The blessed Pope Gregory,' however, as Salimbene puts it, 'when he came hither, caused his bones to be torn from the tomb of porphyry (which is shown empty unto this day) and thrown upon the dunghill and into the cesspool.' For Theodoric was an Arian. To the Germans he is known as Dietrich von Bern (Bern being the German name for Verona, one of his principal residences), and he is one of the great heroes of old Germanic legend, figuring in the second part of the *Nibelungenlied*. In some of the legends the historical element predominates (his expulsion from Italy and sojourn with Attila and his Huns, &c.); in others he is mixed up with giants, dwarfs, and dragons, so that it seems likely that the series comprise, along with tales of the king Theodoric, mythological elements that properly belonged to the god Thor. See Hodgkin, *Theodoric* (1891, new ed. 1923).

Theodosia. See KAFFA.

Theodosius THE ELDER, a Spaniard by birth and a skilful Roman general, was sent to Britain in 367 A.D. to repel the inroads of the Caledonians and restore order to the diocese. He made London his headquarters, and was so successful in his undertaking that he formed the country between Hadrian's Wall and the Forth and Clyde into a new province of the empire, called *Valentia* in honour of the reigning emperors. After a victorious campaign on the Upper Danube against the Alemanni he quelled a formidable revolt in Africa under Firmus the Moor, and was executed at Carthage in 376 upon some uncertain and probably groundless charge.

Theodosius I., THE GREAT, son of Theodosius the Elder, was one of the most notable and most capable of the later Roman emperors. Born about 346 at Cauca in the north-west of Spain, he served under his father in Britain, Germany, and Africa, and won fame as a general by his exploits in Mœsia. Upon his father's death he retired to his native farm, whence he was summoned by Gratian to become his colleague in the purple and emperor in the East (379). It was a critical time, The Goths (q.v.), too numerous and formidable to be attacked *en masse*, flushed too with their recent Cannæ-like victory at Adrianople and the total defeat of his predecessor Valens, were roaming the country at will, unchecked masters of the situation. His military reputation was equal to the strain. He made Thessalonica his headquarters, and within four years, through patience and tact, after reviving the spirits of the imperial troops by small but decisive victories, he broke up the vast Gothic army, attached many of its members to the empire as faithful soldiers and allies under their own chiefs, and restored tranquillity to the troubled country south of the Danube. A serious illness in 380 led to his baptism as a Trinitarian, and, as a consequence, to the restoration of the religious unity of the empire and the promulgation of various edicts against Arianism and other heresies. He appointed Gregory Nazianzen Archbishop of Constantinople, and summoned the second general council, which met there (381) to supplement the labours of Nicæa. The murder of Gratian at Lyons, the advance towards Italy of the upstart Maximus, proclaimed emperor in Britain, and the arrival of Valentinian II. (with his mother Justina and his sister Galla) begging for help led to Theodosius' marriage with Galla, to his victory at Aquileia (388), and to the restoration of his youthful colleague. Hereafter for some years Theodosius lived at Milan enjoying the friendship and respect of its bishop, St Ambrose. The relationship of those two great men—foremost respectively in state and church—honourable to both and dramatic in its climax, is one of the most interesting features of Theodosius' reign. Theodosius was able, just, even generous, virtuous, and religious, but inclined to indolence and of a passionate temper. He had cancelled, upon the entreaties of its bishop and the penitence and humiliation of its leading citizens, the severe measures meted out to Antioch after a riot (387) in which the imperial statues had been contemptuously overthrown; but in 390, when the governor of Thessalonica was lynched by a circus mob for his

punishment of a brutal but favourite charioteer, Theodosius, in spite of expostulations, ordered the people of the city to be invited into the circus and there massacred. At least 7000 were thus put to death. Thereupon Ambrose wrote to Theodosius upbraiding him with the deed, and even after some time had elapsed fearlessly withstood his attempt to enter the church at Milan. The bishop only readmitted the emperor to the sacrament after eight months' retirement and public penance performed in the face of the whole congregation. In 392 Valentinian II. was murdered, and in 394 Theodosius, then at Constantinople, again marched westwards, this time against the Frankish general Arbogast and his puppet emperor Eugenius. After a stubborn fight at the river Frigidus, lasting two days, Theodosius gained a complete victory, and for four months ruled as sole Roman emperor. He expired in the arms of Ambrose on 17th January 395—a date memorable in the history of the later Roman empire, for almost immediately thereafter followed the barbarian invasions of Greece and Italy, which led directly to the subsequent Teutonic settlements in the south and indirectly to the formation of the kingdoms of modern Europe. See Hodgkin, *Italy and Her Invaders* (1892). For Theodosius II. (408–50), see BYZANTINE EMPIRE.

Théodule Pass. See ZERMATT.

Theognis, a Dorian noble of Megara, flourished about the middle or in the latter half of the 6th century B.C. The overthrow of the tyrant Theagenes brought oligarchy and democracy face to face, and produced a period of confusion and struggle, during which Theognis was driven from his native city. Before his return he may have visited Eubœa and Sicily. Under his name two books of elegiacs have come down to us numbering together about 1400 lines, but it is probable that these include some work not by Theognis. Most of his political verses are addressed to a young Megarian noble named Cyrnus, on whom he seeks to impress the orthodox doctrines of Dorian aristocracy. The oligarchs are the 'good'; the commons the 'bad.' At dinner Cyrnus must sit as near as possible to a good man, so as to carry off some benefit from what he says. The growing influence of wealth disturbs his vision of the future. 'Money mixes race;' but such marriages are the bane of the city. His conclusion is that 'the best thing for a man is not to be born into the world at all, and the next best thing is to die at once.' His social verses present him in a less melancholy mood. Here too the didactic element plays a large part, though his wisdom is more worldly than moral. It is a disgrace to be drunk when the company are sober, but also a disgrace to be sober when the company are drunk, and the ideal stage is that of being 'no longer sober and yet not very drunk.' Cyrnus must suit his demeanour to his company. 'Amongst the uproarious,' says Theognis, 'I am very uproarious, and amongst the proper no man more proper than I.' Cyrnus must 'exceed in nothing; the mean is best in all things.'

For beauty of thought, expression, or imagery we must look elsewhere than in the elegiacs of Theognis. Passion there is none, nor do the profound problems of life which filled the drama of a later age seem to have touched the poet's simple Dorian mind. But his shrewd common sense recommended him to conservative fathers as an authority for their children's instruction, and his wise sayings were so well known that it became a proverb, 'I knew that before Theognis was born.' There are works by Bekker (1815), and Welcker (1826); see also Hookham Frere, *Theognis Restitutus* (Malta, 1842); E. Harrison, *Studies in Theognis* (1902), and the edition of the *Elegies* by T. Hudson-Williams (1910).

Theogony, the name given in ancient Greece to a class of poems recounting the genealogy of the gods. Musæus (q.v.) is said to have written the earliest Theogony; but his work, as well as the Theogonies of Orpheus (q.v.) and others, have perished, that of Hesiod (q.v.) being the only one that has come down to us. The story of Creation (q.v.) is on the other hand called COSMOGONY.

Theolocopuli. See GRECO (EL).

Theology (Gr. *θεός* and *λόγος*, the doctrine concerning the nature of God and his relation to the universe). The word first occurs in Plato and Aristotle, who understand by it the doctrine concerning the Greek gods, and apply the term 'theologian' (*θεολόγος*) to Homer, Hesiod, and Orpheus, owing to the religious teaching in their poetry. From Plato and Aristotle the word passed into Christian usage, and was in the 3d and 4th centuries A.D. applied to the apologists and thinkers who made use of the doctrine of the Logos in their exposition of the Christian faith.

In modern times the word is used with a wide range of meanings. In its broadest sense it covers the whole field of inquiry connected with the science of religion. A university faculty of theology, for instance, generally at the present time embraces within its scope all the multifarious forms of study which have a bearing on the origin, history, and beliefs of the different forms of religion which have exercised any influence upon the world. A book like Macculloch's *Comparative Theology* attempts to institute a comparison between the beliefs that have been held in different forms of religion on the main issues of religious faith. It is not too much to say that the scope of theology covers a territory which extends from Frazer's *Golden Bough* at the one extreme to Calvin's *Institutes* at the other.

The methods of theology may not unfairly be compared with those of natural science. (1) Theology first of all has to collect and tabulate its facts—and its facts cover the whole phenomena of religion from the crudest forms of belief that are found in savage tribes to the highly developed faith of the Christian religion. (2) Then it has to collate and interpret these facts, and attempt to find an explanation of them; and it is because of this necessity that the comparative study of religion has become so important a field of investigation in modern times. (3) Lastly, it has to construct a philosophy of religion which will unify and systematise the facts, relate them to each other, and estimate their final value.

But though theology is generally used to-day with this wider connotation and this larger function, up till comparatively recently the area of its operation was restricted to the Christian religion, and its main task was concerned with the exposition and elucidation of the chief elements in the Christian faith. The methods of its working have varied in different ages. (*a*) From the 3d and 4th centuries onward its main function was to defend the Christian religion from attack, to expound its beliefs in reply to heresy, and to formulate its credal statements. (*b*) In the mediæval period the scholastics attempted to articulate the Christian faith and expound it in terms of Platonism, as in the case of John Scotus Erigena, or of Aristotelianism, as in the case of Thomas Aquinas. (*c*) With the Reformation a revolution took place in its *modus operandi*. The Bible became for Protestants the authoritative and only source of doctrine, and the task of theology was to weave the contents of its textual statements into a connected whole, and transform them into an ordered

system of belief. In fact, it may be said that the period from Luther up to Schleiermacher is the golden age of systematic or dogmatic theology. To this period belong such well-known classics as Calvin's *Institutes* and Melanchthon's *Loci Communes*. (*d*) A further revolution was introduced by Schleiermacher, whose *Glaubenslehre* was to theology what Bacon's *Novum Organum* was to natural science. According to Schleiermacher, the essence of religion is to be found in feeling and experience, and it is this feeling and this experience that constitutes the ultimate data of theology. This means, of course, that theology rests no longer upon credal statements or biblical texts, but upon a psychological basis. The inevitable result of Schleiermacher's position was the discovery that Christian doctrine grows out of Christian experience, and depends for its truth and value on the validity of the experience and the correctness of its interpretation. The task of theology, therefore, to-day may be defined as the analysis of the phenomena of religious experience (more particularly Christian experience), the interpretation of that experience, and the erection on the basis of that experience of a constructive statement of the content of religious truth.

The recognition that the facts of religious experience form the ultimate data of theology has of course affected the line of approach to the subject, for by experience is not meant merely the experience of the present day alone, but the Christian experience of the past as well. This means that the study of the history of religious experience is a vital part of the method, and the historical study falls into two parts: (1) *Biblical theology*, which gives an account of the religious experience of the prophets and psalmists and seers of the Old Testament, and of the contemporaries of Jesus and the apostolic leaders in the New Testament. The significance of this experience is that for the most part it is primary and original—the first experience of its kind, and therefore the source of the secondary experiences which are based upon it in later times. Moreover, biblical theology involves not only the study of the primary experience, but the study also of the first attempts that were made to interpret that experience. (2) *Historical theology*, which deals with the continued religious experience in the lives of individuals and in the fellowship of the Christian community, and with the attempts which were made at different times to form doctrines on the basis of that experience and give a philosophical explanation of it. The most elaborate attempt to cover this ground is to be found in Harnack's monumental work on the *History of Doctrine* (7 vols.). Having obtained its analysis of the religious experience of the past from the Bible and church history, theology will then proceed to compare it with the experience of the present day. It will not necessarily reject elements which have no place in modern experience, since it will remember that the law of uniformity does not apply to religious experience and that different ages seem to have reacted in different ways to the divine impact.

Theology has many sub-divisions. *Theology* proper deals with the doctrine of God. *Christology* with the doctrine of the Person of Christ. *Anthropology* with the doctrine of the nature of man. *Soteriology* with the doctrine of redemption. *Pneumatology* with the doctrine of the Holy Spirit. *Ecclesiology* with the doctrine of the church. *Eschatology* with the doctrine of the future life.

The most important modern books on dogmatic or systematic theology are Biedermann, *Dogmatik* (1884); Seeberg, *Zur systematischen Theologie* (1909); Haering, *The Christian Faith* (Eng. trans. 1913); Schlatter, *Das christliche Dogma* (1911); Nitzsch, *Lehrbuch der Evangelisten Dogmatik* (1912); Wernle, *Einführung in das theologische Studium* (1911); Kähler, *Ausgewandte Dogmen* (1908); W. N. Clarke, *Outline of Christian Theology* (7th ed. 1900); W. A. Brown, *Christian Theology in Outline* (1912). Among the older books may be mentioned Rothe, *Dogmatik* (1870), and Martensen, *Christian Dogmatics* (Eng. trans. 1871).

For books of general reference see Hastings, *Encyclopædia of Religion and Ethics* (1908–1926); Herzog-Hauck, *Realencyklopädie* (1896–1909); *The Jewish Encyclopædia* (1901–1912); *The Catholic Encyclopædia* (1908–1915).

The titles of many other theological treatises, besides those above mentioned, will be found in the lists appended to CHURCH HISTORY and ROMAN CATHOLIC CHURCH. See also the articles on the several books of the Bible; those on Jesus Christ, Paul and the other apostles, and on the great Christian teachers; those on great theologians such as Schleiermacher, Baur, Rosmini, Newman, Ritschl; the paragraphs on the churches of the several countries; and the following:

Adam and Eve.	Christianity.	Port-Royal.
Agnosticism.	Clergy.	Prayer-book.
Anabaptists.	Creation.	Predestination.
Antinomianism.	Deism.	Rationalism.
Articles.	Ebionites.	Religion.
Asceticism.	Heaven.	Sabbath.
Atheism.	Hell.	Scepticism.
Atonement.	Inspiration.	Spirit, Holy.
Baptism.	Jews.	Spiritualism.
Bible.	Miracle.	Swedenborg.
Catechism.	Pantheism.	Theism.
Christ.	Pelagius.	Theosophy.

Theophanes, Greek monk and chronicler, was born at Constantinople about 758 A.D. He founded an abbey near Sigriano, but his support of image-worship led to imprisonment. He died in exile at Samothrace in 817. His *Chronicle* (edited by de Boor, Leipzig, 1883–85) covers the period 284–813, and, though inaccurate, affords much valuable information.

Theophany (Gr., 'appearance of God'), specially the appearance of God to the patriarchs in the form of an angel or in human form; also the incarnation and second coming of Christ.

Theophilanthropism, a deistical system of religion drawn up under the French Directory in 1796, and designed to take the place of Christianity, which had been abolished by the Convention. God, virtue, and the immortality of the soul were the main elements of the creed; the services were simple to baldness. The system disappeared about 1802. Attempts at resuscitation during the 19th century met with little success. See A. Mathiez, *La Théophilanthropie* (1903), *Contributions à l'histoire religieuse de la révolution* (1907).

Theophilus, a legendary coadjutor-bishop at Adana in Cilicia, who, when deposed from his office through slanders, gave his soul in bond to the devil, and consequently was reinstated the next morning. But he was soon overtaken with remorse, and through forty days' fasting and prayers prevailed on the Virgin to make intercession for him. She tore the bond from the devil, and laid it upon the breast of the repentant sinner as he lay asleep in the church. Theophilus then made a public confession of his crime and of the mercy of the Virgin, and died three days after. This forerunner of the Faust legend must have reached the West during the 10th century. It was treated by Roswitha, by Hildebert of Tours, and in a 14th-century Dutch metrical version (published by Blommaert, Ghent, 1836). The first dramatic handling of the subject was in French by Rutebeuf (q.v.); then repeatedly during the 14th and 15th centuries in Low-German (*Theophilus, in Icelandic, Low-German, and other Tongues*, by Dasent, Lond. 1845). See A. Ebert, *Allgemeine Geschichte der Literatur des Mittelalters*, iii.

Theophilus, Bishop of Antioch from 168, wrote (180–181) in three books, addressed to a pagan

friend Autolycus, an apology for Christianity (ed. by Otto in *Corpus Apologetarum*, vol. viii. Jena, 1861). The genuineness of a commentary on the gospels is defended by Zahn, assailed by Harnack and others.

Theophilus OF ALEXANDRIA, succeeded as 22d bishop of the see in 385 A.D., and showed himself a man of great contentiousness as well as learning. He strove with the pagans of Alexandria and destroyed their temple of Serapis (q.v.); he quarrelled with his archpresbyter Isidore, an Origenist, and later condemned Origenism in general; and finally he was concerned in the events which led to the deposition of St John Chrysostom. Theophilus died 'of lethargy' 15th October 412. His writings, which are unimportant, include several 'Easter Letters' and a work against Origen. See CHRYSOSTOM, ORIGEN.

Theophrastus, naturalist, essayist, and philosopher, born at Eresos, in the island of Lesbos, probably 373 or 368 B.C., repaired, after an excellent education, to Athens, where he heard Plato and Aristotle, attaching himself particularly to the latter, whose intimate friend and successor he became. He accompanied his master to Stagira, and inherited, by will, the whole Aristotelian library, the largest then known, including the philosopher's original manuscripts and unpublished writings. As head of the Peripatetic school he displayed an all-round versatility not unworthy of Aristotle himself, and was the reputed author of 227 works. His authority remained for many years paramount in logic, psychology, ethics, politics, rhetoric, physics, and metaphysics, in all of which subjects he preserved the lines of his predecessor, while supplementing most of them wherever they seemed defective. His writings are in great part lost, particularly the valuable zoological series in which he dealt with the instincts and habits of animals; but we still possess his *History of Plants*, his *Causes of Plants*, his treatises on *Stones*, on *Fire*, and on *The Senses*. In his hands ancient botany attained its highest development, and after him it seems to have been cultivated only in its relation to medicine. His *XXX. Characters* is another of his extant works—a masterly delineation of moral types, which, however, some scholars assume to be a later compilation from a more discursive original of his. He died about 287 B.C., after directing for a whole generation the Peripatetic school, which attracted many disciples from all parts of the Hellenic world. As its permanent seat of instruction he bequeathed to it his house, garden, and colonnades.

For his position in Botany, see Berendes, *Die Pharmacie bei den alten Culturvölkern* (vol. i. 1891), and Greene, *Landmarks of Botanical History* (vol. i. 1909); in Ethics the masterly edition of the *Characters*, with introduction and trans. by Sir R. Jebb (1878; new ed. 1909); in Psychology the edition and translation of *The Senses* by G. M. Stratton (1917); and in Literature the articles CHARACTERS, LA BRUYÈRE. See also Usener's *Collectanea Theophrastea*.

Theophylact, a famous Greek exegete, a native of Euripus in Eubœa, who became Archbishop of Achrida in Bulgaria in 1078, and died after 1107. He wrote commentaries on almost the whole Bible, printed in Venice (3 vols. 1754–58).

Theopompus, a Greek historian and orator of the 4th century B.C., was a native of Chios. In the twelve books of his *Hellenica* he told the story of Greece from 411 to 394. One of the Oxyrhynchus papyri (published by Grenfell and Hunt, 1908) is accounted by some a fragment of the *Hellenica*, but by others is attributed to another historian Cratippus (q.v.). The digressive style of Theopompus is well illustrated in the fifty-eight books of his *History of Philip*, which afforded material for later writers including Plutarch and Photius. An edition of the extant works of Theopompus was issued in 1909.

Theorbo. See LUTE.

Theosophy, literally divine wisdom (*theos, sophia*), is a name that since the time of Ammonius Saccas, in the third century after Christ, has been used in the West to cover various schools of religious philosophy, which all unite in the fundamental conception that man, in his innermost nature, is a spiritual being, one in his essence with the Universal Spirit manifested in and through the universe. In this general sense it has been taken to include mystics differing widely from each other in details; among these are the Simonian, Ophite, and Valentinian schools of so-called Gnosticism; the Neoplatonist of Ammonius Saccas, Porphyry, Plotinus, Iamblichus, and Longinus; the great Hermetic and Rosicrucian orders, which kept an unbroken tradition through mediæval and modern Europe; together with the teachings of men like Jakob Boehme, Henry Vaughan, and Law. These may be taken as representing the Occidental stream of Theosophical thought, which has naturally acquired a Christian tone in its symbolism, whereas the Oriental has utilised the symbolism of the great eastern religions. In the East the system now called Theosophy has been known for ages under the titles of Âtmâ Vidyâ ('spirit science'), Brahmavidyâ ('science of Brahma'), Gupta Vidyâ ('secret science'), and other similar names. All alike, in East and West, draw their inspiration and their methods from the 'Wisdom Religion,' the ancient esoteric philosophy. This claims among its initiates the men who have given to the world fragments of the teaching as basis for world-religions, men like Buddha, Confucius, Zarathustra, Pythagoras, Plato, Jesus, to say nothing of yet more ancient sages, Manu, Nârada, and other great Rishis. In the 16th century Paracelsus and Giordano Bruno are among its grandest exponents, and in our own day its messenger was a woman of Russian birth, Helena Petrovna Blavatsky (1831–91), who was initiated in Tibet, and whose works form the most complete exposition of the esoteric philosophy.

The Esoteric Philosophy, or Wisdom Religion, is a body of teaching, philosophical, scientific, and religious, which is believed to be preserved from generation to generation by a brotherhood of initiates scattered over the world, but preserving close and intimate relations with each other. It is to a group of these now stationed in Tibet that the founding of the Theosophical Society in 1875 is ascribed, and it is these who are constantly referred to in Theosophical literature as Mahâtmas, Arhats, Masters, Brothers, or Adepts. They are living men, who have evolved the spiritual nature until the physical body and brain-consciousness have become ductile instruments for the spiritual intelligence; and who, by virtue of this evolution, are said to have gained a control over natural forces which enables them to bring about results that appear to be miraculous. The possibility of this evolution, and the nature of the powers inherent in the highly evolved man, derive inevitably from the postulates of the esoteric philosophy.

This philosophy teaches as basic principles an eternal existence beyond human cognition, existence *per se*, absoluteness or 'be-ness.' This is manifest as the LOGOS, or WORD, existence made articulate, the Source of Life in a universe; emanated by him, he is immanent in it, as its root substance, matter on its negative, and spirit on its positive side. Spirit and matter are therefore not separable, but are merely the opposed poles of the one root-substance, and are present in every

particle, as the poles in each fragment of a broken magnet. Evolution consists in the gradual densifying of the root-substance through seven stages or planes of differentiated existence, the matter aspect becoming more and more prominent as the evolution proceeds, and the spirit aspect becoming more and more hidden; thus matter reaches its fullest differentiation, evolving the whole of its capacities as a vehicle. From this point of completest materiality begins the returning curve, during which matter becomes translucent to spirit, and spirit becomes individualised and self-conscious on all planes; having manifested itself as brain-intellect on the most material plane, it manifests all its subtler super-intellectual powers on the ascending arc, but always with the addition of self-consciousness and individuality, until, at the completion of the cycle, matter has become a perfect objective presentment of spirit, a perfect vehicle of spiritual activity.

The seven stages of cosmical evolution, aspects of the universal Divine consciousness, correspond with seven stages of human evolution, aspects of the human consciousness, by each of which man can cognise directly the corresponding cosmic state. The two highest of these, the Divine World, are the habitat of highest spirit, beyond the limits of our system; there dwell the Monads, 'the spirits of just men made perfect,' in conscious union with the Logos. In the five remaining we have the stages of the unfolding human consciousness: (1) the embodied spirit; (2) the spiritual soul, or pure reason; (3) the intellect, or ego; these are the immortal part of man. The perishable part, which hands on its experiences to the imperishable, in the form of intellectual and moral capacities, is: (4) the lower mind working in mental matter, or mind-stuff; (5) the emotions, passions, and appetites working in astral matter; (6) the vitality, working in physical ether; (7) the waking consciousness, working in the brain and nervous system. These seven are really but the aspects of the embodied spirit, working in matter of different densities, which modify the expression of his own inherent capacities. Another way of looking at the same facts is to see the spirit as inherently triple—an image of the triplicity of Divine consciousness—and as manifesting as (1) will; (2) wisdom; (3) activity, the *functional* aspects of the embodied spirit, the pure reason, and the intellect; these, modified by expression in denser matter, are the before-named mind, emotions, and vitality; the mind, the lower form of intellect; the emotions, evolving towards unity, and therefore towards wisdom; the vitality, the will to live; these unite in the waking consciousness, enshrined in the physical body.

At death the dense body, which was the home of the waking consciousness, disintegrates, and is followed by the dispersion of the etheric double, the vehicle of vitality; the man himself, with the memory of his earth-life remains awhile in the intermediate, or astral, world. When the grosser part of his emotional nature drops away from him he goes on into the heaven world, and there all his higher emotions and his thoughts and memories are transmuted into qualities, during a long period of bliss. These qualities, the fruits of his experiences on earth and his memories of the past, are taken up into the immortal ego, and the lower mind fades away. The length of the heavenly life depends on the mental and moral activities of the earthly life, for all these must be assimilated before return is possible. Then the consciousness again becomes embodied in the denser matter of the heavenly, intermediate, and physical worlds, enriched with the faculties gained in the past, to gather fresh experience for further progress.

For the method of evolution, according to Theosophy, is Reincarnation. The reincarnation ego is the agent in progress. In the far-off past, when physical evolution, guided by the indwelling spirit, had produced man's physical form, the ego first became incarnate therein, and has since reincarnated after each heavenly interlude. Throughout each incarnation he labours to evolve in the body he inhabits the capacity to respond to his impulses, but it is through the moulding of successive bodies that he accomplishes his task of human elevation. The thoughts produced by his activity are real *things* on the mental plane, made of subtle matter, 'thought-stuff,' a form of ether. The thoughts of each life ultimate in a thought-body, that expresses the result of that incarnation. The 'innate character' which the child brings into the world is this result of its own past, and is physically expressed in its brain and nervous organisation. The reincarnating ego is drawn by affinity to the nation and family fitted to supply the most suitable physical material and psychical environment. The physical particles thence supplied are stamped with the racial and family characteristics, bodily and mental, but their arrangement is dominated by the thought-body resulting as above stated. Thus mental and moral capacities gained by struggle in one or many incarnations become innate qualities, exercised 'naturally,' without effort, in a later incarnation, and thus progress is secured. This law, by which all causes work out their due effects, is called Karma (the Sanskrit word for action), and according to this all thoughts, good and bad, leave their traces on the thought-body and reappear as tendencies in future lives. No escape from this sequence of cause and effect is possible; all our past *must* work itself out, but as the same agent that made the past is making the present it sets up fresh causes in meeting the effects of the past. Thus a trouble, generated by past action, is inevitable; it is in our Karma. But we may meet it badly, and so set up fresh cause for bad Karma in the future; or we may meet it well, and so generate good Karma. We made our present destiny in our past, and we are making our future destiny in our present.

The teaching of Reincarnation as the method, and Karma as the law, of evolution leads to the doctrine of universal brotherhood, which it is the object of Theosophy to realise. Offspring of the universal life which is the soul of the universe, bound inextricably together by the ties of Karma, evolving to one common goal of perfect humanity, how should men be aught but brothers? Reincarnation crushes out all differences of race, sex, class; Karma so interweaves human lives that each can only find happiness and perfection as all find it. These facts in nature yield, it is claimed by Theosophy, a scientific basis for ethics, and make the practical recognition of human brotherhood a necessary condition of accelerated evolution.

Thera. See SANTORIN.

Theramenes, an Athenian statesman, constitutionalist and trimmer, of the 5th century B.C. He became unpopular by seeking to temper the extremities of oligarchy and democracy, and, while a member of the government of the Thirty Tyrants, incurred the hatred of the most cruel of the thirty, Critias (q.v.), whose health he drank in the hemlock cup (403 B.C.).

Therapeutæ (Gr. 'worshippers'), an ascetic sect, mentioned in the *De Vita Contemplativa* of Philo, and living chiefly by Lake Mareotis, near Alexandria. The Therapeutæ were formerly regarded as a branch of the Essenes, but Harnack (*New Schaff-Herzog*, 1911, xi. 411) rightly contests this view. The two sects resembled each other in

discipline, but the regulations of the Therapeutæ were more severe in regard to food and in preferring the solitary life to the common fellowship. Throughout the week each member lived in his lonely dwelling (*μοναστήριον*), but on the Sabbath they assembled for joint worship. The importance assigned by them to the number seven is shown by the institution of a festival once every seven weeks. This festival culminated in the *πανυχίς*, when solemn dancing and choric singing were practised all through the night by bands of men and women. Their method of conducting services is carefully described by Philo. The Therapeutæ made a renunciation of the world, not because they deemed the world, *per se*, evil, but because 'they abjured money rather than matter' (J. Moffatt, Hastings, *E.R.E.*, xii. 316 b) and hated avarice. In their mysticism they were by no means antinomian, but they combined a devotion to the Law with a quiet life of philosophic prayer and meditation.

In view of the fact that the sole authority for the Therapeutæ is Philo, first cited by Eusebius, the existence of this sect has been challenged altogether or relegated to a much later date. The remarkable similarity between the asceticism of the Therapeutæ and Christian monasticism has been regarded as explicable only if the Therapeutæ were a Christian order; the account attributed to Philo would then be spurious. These theories were finally and most effectively defended by P. Lucius (*Die Therapeuten*, Strasburg, 1879), but since F. C. Conybeare's *Philo about the Contemplative Life* (Oxford, 1895), the credibility of Philo may be held to be generally conceded. W. Bacher (*Jewish Quarterly Review*, vii. 703) accepts the identification by Harkavy of the Therapeutæ with the *Maghāriyah*, 'men of the cave,' mentioned by the Karaite Kirkisani in the 10th century, but Poznansky (*Rev. Ét. Juives*, 1905, 19–23) thinks this uncertain.

On account of the controversy about the authenticity of Philo's description of the Therapeutæ great care is necessary in selecting literature on this subject. The reader is advised to follow the lines laid down by J. Moffatt (*cit. supra*), and to consult the bibliography which he furnishes.

Therapeutics (Gr. *therapeuō*, 'I heal') is that division of the science of medicine which treats of the various actions of remedies upon the diseased animal system, or the means by which nature may be aided in her return to health. 'Suggestive Therapeutics' is a term for Hypnotism (q.v.) employed as a sanative agency.

Therapia, a small Turkish town, finely situated on the Bosporus, 15 miles NE. of Constantinople, is a favourite summer residence.

Theresa, St. See Teresa.

Theresiopel. See Subotica.

Therezina, capital of the Brazilian state of Piauhy, on the Parnahyba, about 200 miles SSE. of Maranhao, with which it is connected by rail.

Thermidor, i.e. the 'Hot Month,' formed, in the calendar of the first French Republic, the 11th month, and lasted from the 19th July to the 18th August. The 9th Thermidor of the Republican year 2 (July 27, 1794) is historically memorable as the date of Robespierre's fall, and the termination of the Reign of Terror. The name Thermidorians was given to all those who took part in this *coup d'état*, but more particularly to those who were desirous of restoring the monarchy.

Thermionic Valve. See Wireless Telegraphy, Wireless Telephony.

Thermit, a mixture of finely divided aluminium with ferric oxide, used to produce very high temperatures in welding. The reaction is $Fe_2O_3+2Al=2Fe+Al_2O_3$.

Thermodynamics is the branch of physical science which discusses the relation between heat and work. It forms the kernel of the modern doctrine of Energy (q.v.); for it was by the discovery that heat was energy and not matter that the conservation principle was established in its widest generality. Towards the end of the 18th century Davy and Rumford had independently shown that the caloric theory of heat was untenable. But it was not till thirty or forty years later that the scientific mind began to emancipate itself from this theory which regarded heat as an imponderable substance effecting thermal changes by combination with ordinary ponderable matter. With the early development of the true theory the names of Colding, Hirn, Joule, and Mayer are closely associated. The labours of Joule (q.v.) were particularly valuable, as he it was who first in 1843 obtained a really good measurement of the mechanical or dynamical equivalent of heat—that is, the amount of dynamical work which is equivalent to a given quantity of heat. This equivalent is commonly called Joule's Equivalent. By demonstrating experimentally that wherever energy in the dynamical form is lost an exact equivalent of heat is always obtained, Joule established what is known as the First Law of Thermodynamics. Briefly put, this law is the statement that heat is energy, and can be measured in the same units. When during any transformation of energy heat is generated, it is at the expense of an exact equivalence of energy in some other form. Or when, on the other hand, there is a disappearance of heat, an exact equivalence of energy in some other form or forms will appear.

It is a familiar fact that relative motion is destroyed by friction. But destruction of motion means loss of kinetic energy; and it is this lost energy which is transformed into the heat invariably produced by friction. There is no difficulty in effecting the transformation of other forms of energy into heat. It is impossible, indeed, to prevent some of the energy taking the form of heat whenever a transformation is effected—whenever, in other words, any change of physical conditions occurs. But whatever be the manner of the transformation, the first law of thermodynamics is found to be always fulfilled, the amount of heat generated is equivalent to the energy, in other forms, which has disappeared. Joule's earliest determination of the dynamical equivalent of heat differed by only ⅓ per cent. from his latest (1878). According to it the quantity of heat capable of raising the temperature of a pound of water, weighed *in vacuo*, from 60° to 61° Fahrenheit requires for its evolution an expenditure of work represented by the fall of 772·55 pounds through a distance of one foot at the sea-level at the latitude of Greenwich; or the dynamical equivalent of the unit of heat defined as above is 772·55 foot-pounds at Greenwich. The scientific unit of heat is now taken to be the amount of heat required to raise 1 gramme of water from 0° to 1° centigrade. Hence, reducing to the lower temperature and taking account of the change of thermometric scale, we get for the value of Joule's Equivalent 1391·8 foot-grammes or 42422 centimetre-grammes or $4·1623\times10^7$ ergs. More recently the researches of Rowland and Griffiths have raised this last figure to $4·194\times10^7$.

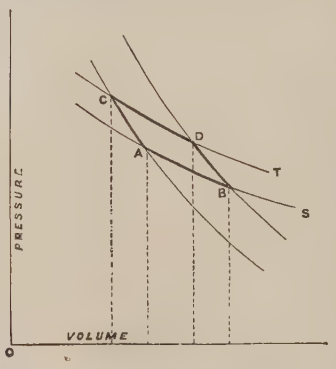
To convert work into heat is an easy matter; but not so the reverse operation, to convert heat into work. This, however, is the function of all our heat engines, using the term in its widest sense as including steam-engines, gas-engines, and all machines which do work by combustion of fuel. It has long been recognised that such machines can work only when there is a difference of

temperature. It matters not how much heat may be stored up in a body, it is practically impossible to utilise that heat as working energy unless we have a neighbouring body of lower temperature. But when a difference of temperature exists there is a constant passing of heat from the warmer to the colder body, so that the temperatures tend to become equalised. And thus the very nature of heat is such as to make it lose more and more of its availability for being transformed into useful work. Suppose, however, that it was possible to prevent heat from passing by conduction or diffusion from the warmer to the colder body, and that whatever heat was taken from the system during a suitable series of operations was altogether transformed into work, how does this transformability of the heat depend upon the temperatures? This is the question which is answered by the Second Law of Thermodynamics, the development of which is closely associated with the names of Carnot, Rankine, Clausius, and Thomson (Lord Kelvin).

Sadi Carnot (q.v.), in his famous *Réflexions sur la Puissance du Feu* (1824), clearly laid down the lines along which the complete theory must be developed. His own argument was vitiated by the assumption of the then accepted caloric theory of heat. But we know from his posthumous papers published in 1878 that Carnot himself had, before his premature death in 1832, recognised that heat was energy, and had fully enunciated the First Law of Thermodynamics.

Besides sketching out a series of experiments almost identical with the valuable researches subsequently made by Joule and Kelvin, Carnot made an estimate of the dynamical equivalent of heat, which, though one-sixth too small, was more accurate than Mayer's made in 1842. Carnot is now recognised as one of the greatest scientific men of the century; and had he survived there is no doubt that the theory of heat would have been established nearly thirty years earlier than it was. Carnot's methods, as given in his book, were not appreciated till Kelvin in 1848 drew attention to them. Soon after Clausius, correcting the one flaw in Carnot's reasoning, established the Second Law on its modern basis. To Kelvin we owe the doctrine of the dissipation of energy and the definition of the absolute thermometric scale. By this is meant an energy method of measuring temperature, independent, that is, of the kind of substance used. See TEMPERATURE and THERMOMETER. To make this scale intelligible involves the discussion of Carnot's principle, which is virtually the second law.

The novel feature of Carnot's method was the invention of the cycle of operations, and especially the reversible cycle. An engine or working substance will have passed through a cycle of operations when all its parts have recovered exactly those physical conditions (volume, pressure, temperature, and the like) which they had at the beginning. It is only when such a cycle has been completed that we have any right to reason about the transformations of energy which have taken place during the progress of the operations which constitute the cycle. For simplicity take as working substance a definite quantity of air contained in a chamber, whose volume may be varied indefinitely by the outward or inward motion of a piston. We shall assume that the walls of this chamber can be made either perfectly impervious to heat or perfectly diathermanous. When in this latter condition the substance is to be kept in contact with another substance at the same constant temperature. Volume and pressure changes, which take place in this condition in the working substance, take place *isothermally*, there being no change of temperature. On the other hand, when the impervious condition is realised, whatever changes take place in the working substance take place *adiabatically*, there being no loss or gain of heat. When the temperature of air is kept constant we know by Boyle's law that the pressure varies inversely as the volume. This relation and all similar relations may be represented graphically by means of a curve, every point of which denotes a definite state of pressure and volume. Such a curve is called an *isothermal* line. For any given mass of gas or air there will be a different isothermal line for each different temperature. If we trace a series of isothermals, we can at a glance determine any one of the quantities, temperature, pressure, and volume, when the other two are given. In the figure two isothermals, AB, CD, corresponding to temperatures S and T, are shown. T is supposed to be the higher temperature. Volume is measured horizontally from the origin O, and pressure vertically. The lines CA, DB are supposed to be *adiabatic* lines. They show how volume and pressure vary with one another when heat is allowed neither to leave nor to enter the substance. Just as along each isothermal the temperature is constant, so along each adiabatic there is a quantity called the entropy, which remains constant. Adiabatic lines are also called isentropic. To pass from one isotherm to another we must change the temperature. In like manner, to pass from one adiabatic to another we must change the entropy.



Begin with the working substance in the state A —i.e. with volume Oa, pressure aA, and temperature S. Compress adiabatically till the temperature rises to T and the state C is reached. In this first operation a definite amount of work is done, but no heat is gained or lost. Next, let the substance expand isothermally to any state D, doing work and at the same time taking in heat from the source, which is kept permanently at the temperature T. In the third operation let the substance expand adiabatically until the temperature falls to S and the state B is reached. In this operation a definite amount of work is done by the substance. Finally, compress the substance isothermally until the original state A is reached. Here work is done on the substance, and heat is given out to the refrigerator, which is kept permanently at temperature S. The cycle is now complete. The work done by the working substance or engine is represented by the area ACDB; and this work done must be equivalent to the heat which has disappeared. If Q units of heat are taken in in the second operation (CD), and q units of heat given out in the fourth (BA), Q must be greater than q, and the difference $(Q - q)$ will be dynamically equivalent to the work (W) done by the engine. Now if the engine is reversible in Carnot's sense, it will be possible to go round the cycle in the opposite direction, reversing all the physical processes involved, and generating $(Q - q)$ units of heat by the expenditure of W units of work. Carnot's principle is that this reversibility is the test of a perfect engine. A more efficient engine than the reversible engine cannot

exist. To prove this, let N be the reversible engine, and suppose that M is a more efficient engine than N. In other words, M can, with a given supply of heat, do more work than N. The $(Q - q)$ units of heat taken in by M during the cycle will be transformed into $(W + w)$ units of work; and of these W units will be changed back into $(Q - q)$ units of heat by the reversible engine, N, working backwards. Thus in a complete double cycle w units of work will be done, while the heat originally taken from the source at temperature T has been restored to it. To account for this overplus of work we must suppose an equivalent of heat to be taken from the refrigerator at temperature S. Hence if a more efficient engine than the reversible engine existed it would be possible to do work by means of heat taken from the refrigerator. By taking as refrigerator any limited part of the universe, we should be able to cool that part until all heat was removed from it, and so to obtain from it useful work. Such a result is contradicted by all our experience. Hence we conclude that the reversible engine is the perfect engine.

Returning to the cycle of operations, we see that Q units of heat are taken in at the temperature T, and q units given out at the temperature S; and by experience we know that Q and T are greater than q and S respectively. Kelvin's absolute scale of temperature is obtained by defining T and S such that their ratio is the same as Q and q, or

$$q : Q = S : T;$$

this gives $Q - q : Q = T - S : T$.

Now $(Q - q)/Q$ is the ratio of the usefully transformed heat to the whole heat supplied, and is called the efficiency of the engine. Hence the greatest possible efficiency of a heat engine is measured by the ratio of the difference of temperatures of the source and refrigerator to the temperature of the source. This absolute scale is found to be in close accordance with the scale of the air thermometer; and its zero, as determined by Kelvin and Joule, lies 274° centigrade below the freezing-point of water. Thus a perfect engine working between temperatures 0° to 100° C. would have an efficiency of $\frac{100}{374}$, or little more than one-fourth. Practically it will hardly exceed half this value.

Now looking back to the diagram we see that Q is the heat taken in as we pass from the adiabatic CA to the adiabatic DB along the isotherm T, and similarly that q is the heat taken in as we pass between the same adiabatics along the isotherm S. But $Q/T = q/S$, and the same ratio is given by whatever isotherm—i.e. at whatever temperature—we may pass between the adiabatics. We may therefore take this ratio to be the amount by which the entropy increases as we pass from the one adiabatic to the other. The universal tendency of heat is to pass by conduction or radiation from the warmer to the colder body. If, then, H units of heat pass from a body at temperature T to a body at temperature S, the warmer body will lose entropy to the amount H/T, and the colder will gain entropy H/S. S being smaller than T, the gain will be greater than the loss, and hence the entropy of the system will increase by the amount $H(S^{-1} - T^{-1})$. Thus we have Clausius' theorem that the entropy of the universe tends to a maximum. Kelvin's view is slightly different. His doctrine of the dissipation or degradation of energy, otherwise the loss of motivity, will be found discussed under ENERGY. Maxwell has pointed out that if we could deal with the individual molecules of gaseous matter, it would be possible without expenditure of work to raise the temperature of one region and lower that of another, in contradiction to the second law of thermodynamics. Thus it appears that the second law stands on a distinctly different footing from the first law. Its basis is really to be found in the fact that we can deal with molecules of matter only in the aggregate and statistically, and not individually. That it is, nevertheless, essentially involved in many of the processes of nature is shown by the remarkable results which have been obtained by its means. Its consequences have been developed by Rankine, James Thomson, Kelvin, and Clausius, and in later times by Massieu, Gibbs, Helmholtz, and others. Thermo-electricity, radiation, capillarity, the conditions of equilibrium of heterogeneous bodies, the co-existence of different states of the same body, and generally the interrelations of electricity, magnetism, heat, and light, all give interesting illustrations of the second law of thermodynamics.

See Maxwell's *Theory of Heat* and Tait's *Heat* for elementary discussion of the subject, and Tait's *Thermodynamics* for the historical aspect. Bayne's *Thermodynamics* and Parker's *Elementary Thermodynamics* (1891) may be named, and Planck's *Treatise* (trans. 1903). J. J. Thomson's *Applications of Dynamics to Physics and Chemistry* (1888) contains the solution of many complex problems. Clausius' and Kelvin's original papers are still the most important in all thermodynamic literature.

Thermo-electricity. See ELECTRICITY, p. 271.

Thermometer is a name which, though applicable to any instrument for measuring change of temperature, is usually restricted to such instruments as measure by means of the expansion of substances, and more especially of liquid substances. The ordinary thermometer consists of a glass tube of very narrow bore, which opens out into a bulb at one end. This bulb and part of the capillary tube are filled with the thermometric substance, generally mercury, sometimes alcohol or other liquid, but never water. Mercury is pre-eminently suitable for thermometric purposes. Its freezing-point is lower than the temperatures with which we have usually to deal; and its boiling-point is much higher than that of any other substance which is liquid at ordinary atmospheric temperatures. Throughout a long range it expands very steadily as heat is applied to it. By defining degrees of temperature in terms of equal successive increments of volume of mercury, we get a very serviceable scale, differing but slightly from the scale of degrees as defined thermodynamically by Lord Kelvin (see TEMPERATURE, THERMODYNAMICS). Mercury again is opaque, and does not wet the surface of the glass with which it is in contact. Alcohol and water, on the other hand, are transparent, so that when the former is used as the thermometric substance it has to be coloured. The peculiar behaviour of water near its freezing-point quite condemns its use in thermometry, even if it were suitable in other respects (see HEAT). It would, however, be highly inconvenient otherwise, inasmuch as its freezing and boiling points lie well within the range of easily attainable temperatures. As regards its boiling-point, alcohol has the same disadvantage. It is in the measurement of very low temperatures that alcohol and ether thermometers are particularly valuable. These substances have also the further merit of having a high expansibility.

When the capillary tube and bulb have been constructed, the first operation is to fill in a sufficient quantity of liquid. This is effected by first heating the bulb to expand the air contained in it, and then plunging the open end of the tube into the liquid, which gradually rises through the bore as the air in the bulb cools. The tube is then set with the bulb down and tapped until most of the liquid is shaken out of the tube into the bulb. A second heating of the bulb until the

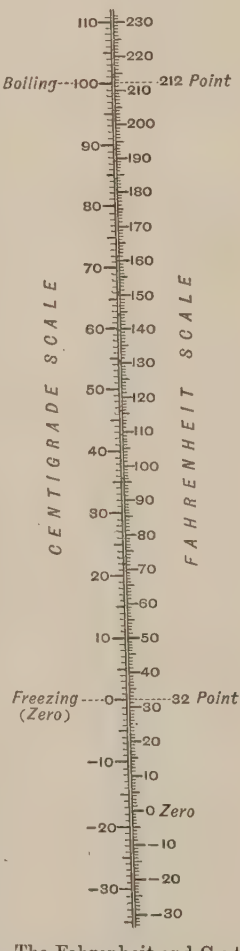
liquid boils still further diminishes the amount of air inside; and more liquid is introduced as in the first operation. The manipulation requires great skill; and the first stage is reached when at ordinary temperatures the required quantity of liquid fills the bulb and part of the tube. The next stage is to seal hermetically the upper end of the tube when it is quite free of air, a condition which is attained by heating the upper surface of the liquid to the boiling-point and so driving out the air. When the sealing is effected the tube and bulb are filled almost entirely with the thermometric substance and its vapour. Probably no thermometer is quite clear of air, for it is difficult, if not impossible, to get rid *absolutely* of the air held in solution in liquids; but the quantity mingled with the liquid or its vapour is excessively minute in the best thermometers.

It now remains to graduate the instrument so that its indications may be capable of interpretation. The most delicate thermometers have an arbitrary scale engraved on the tube before the operation of filling is begun; and afterwards certain definite and known temperatures are measured in terms of it, so that its indications become known. For all ordinary and most scientific purposes it is sufficient to engrave the scale on the stem after the positions of the liquid column have been determined for the two chosen standard temperatures. Thermometers with *attached* scales engraved on ivory or brass are useless for other than the roughest determinations.

The two standard temperatures universally used in graduating a thermometer are the freezing and boiling points of water. Previous to the discovery that these, under given conditions, correspond to definite temperatures, thermometry could hardly be said to exist. In Newton's scale of temperature (1701) the freezing-point of water is taken as zero, and the temperature of the human body as 12°. Fahrenheit, who first made (1721) a mercury thermometer, took as his zero the lowest temperature then obtainable (from a mixture of salt and ice), and called the temperature of the human body 8°. Each degree was subdivided into twelve parts; and subsequently these twelfths were taken as the degrees. This made the temperature of the body 96°; and it was found that the freezing-point of water was 32°. When shortly afterwards it was discovered that the boiling-point of water was always the same under the same barometric pressure, a second and easily determinable standard temperature was obtained. Thenceforward this boiling-point, under a pressure of 30 inches, was fixed at 212° on the Fahrenheit scale, the freezing-point being as before 32°. With these as standard, the temperature of the body is 98°; so that the present Fahrenheit scale is not exactly that which Fahrenheit himself adopted. Celsius in 1742 suggested that the boiling-point be called zero, and the freezing-point 100°. In the modern centigrade scale, commonly called the Celsius scale on the Continent, the freezing-point is taken at zero and the boiling-point under 760 millimetres pressure (29·92 inches) at 100°. Réaumur divided the interval between the freezing and boiling points into eighty divisions, from 0° to 80° Réaum.

The centigrade scale is used almost exclusively for scientific purposes. British and American meteorologists, however, prefer the Fahrenheit scale, which has two distinct merits as compared with the centigrade. Its degree is smaller, so that by reading to tenths the observer has a more delicate instrument. To attain the same accuracy with the centigrade the observer must read to half-tenths. Again, the freezing-point being at 32°, it is only under severe wintry conditions that *negative* Fahrenheit temperatures are met with. So inconvenient is the constant occurrence of negative temperatures on the centigrade scale that it is very usual in continental observatories to write −1°, −2°, −3°, &c. in the form 99°, 98°, 97°, making the freezing-point practically 100°, and the boiling-point 200°. For temperatures above the freezing-point the 'hundred' may be omitted without any fear of confusion.

It is often necessary to transform temperature readings from one scale to another, and more especially from centigrade to Fahrenheit, since the latter scale is the more familiar to English readers. The simplest rule is: Double the centigrade number, diminish it by one-tenth of itself, and add 32. The converse rule for changing Fahrenheit into centigrade is: Subtract 32, increase the remainder by one-ninth of itself, and take the half. In the figure the Fahrenheit and centigrade scales are shown side by side. To reduce Réaumur to Fahrenheit, multiply by $2\frac{1}{4}$ and add 32. To reduce Réaumur to centigrade, increase the number by one-fourth of itself. These rules are simply expressions of the truth that 9 degrees on the Fahrenheit scale, 5 degrees on the centigrade, and 4 degrees on the Réaumur all measure the same temperature interval.



The Fahrenheit and Centigrade Thermometer Scales.

Various modified forms of thermometer are used for particular purposes. Thus the measurement of the humidity of the atmosphere is effected by means of the *wet-bulb* thermometer. In this instrument the bulb is covered with a woollen material kept constantly wet by the capillary action of its hanging ends, which dip into a vessel of water. When the air is saturated with moisture (see DEW) there will be no evaporation from the moist surface covering the bulb, and the wet-bulb thermometer will give the same indication as the ordinary dry-bulb. In a dry and warm air the water surrounding the bulb will evaporate at a rate depending on the dryness and the temperature. This evaporation is accompanied by a cooling of the evaporating substance and the bulb in contact with it, so that the wet-bulb thermometer will indicate a temperature lower than the temperature of the air as shown by the dry-bulb thermometer. The less humid the air is at a given temperature the greater is the difference of readings on the wet- and dry-bulb thermometers.

Maximum and *minimum* thermometers belong to the self-registering class of instrument. The ordinary clinical thermometer for taking the temperature of the body is one form of maximum thermometer. In it a constriction above the bulb

prevents the mercury column flowing back *of itself* into the bulb. Thus the upper end of the column continues to indicate the highest temperature reached until it is shaken down by the operator. For meteorological purposes maximum and minimum thermometers are usually laid horizontal or nearly so. In one form of maximum thermometer the mercury pushes a small index in front of it, which remains indicating the highest point reached after the mercury has contracted because of cooling. In the minimum thermometer the index is set in the alcohol which is used as the thermometric substance. As the alcohol contracts it drags with it the index, whose upper end indicates the lowest point reached by the curved capillary surface of the liquid. For measuring the temperatures at different depths of the sea various devices have been used by which the temperature at any required point can be registered, so that it matters not through what temperatures, high or low, the instrument has to pass before it comes into the hands of the observer. The form used so successfully in the *Challenger* expedition will be found described in the first volume of the Physical and Chemical *Reports*.

Instruments for continuous registration of successive temperatures, or for self-registration of temperatures at short intervals of time, form an indispensable part of the equipment of complete meteorological observatories. The photographic method is the simplest in which a mercurial thermometer can be employed. Things are so arranged that the sensitive paper, kept steadily moving by clockwork behind the thermometer, can receive only light which has passed through the small bore of the tube above the mercury. When the record has been taken, any point on the line which separates the part of the paper that has been exposed to the light from the part not affected corresponds to the height of the mercury column in the tube at the very instant at which that point on the line lay behind the thermometer. From this record, therefore, any temperature can be picked out at leisure long after the registering of it.

For general convenience and for the certainty of its indications the mercurial thermometer is pre-eminent. Historically older, however, and scientifically superior is the *air* thermometer. As shown in the article GAS, &c. (q.v.), the product (pv) of the pressure and volume of a gas is very nearly proportional to the absolute temperature. Hence if we keep the pressure constant, the change of volume will be a direct measure of the change of temperature. The practical difficulty is to keep the pressure constant. It requires indeed a skilful experimenter to manipulate satisfactorily an air thermometer. Such a thermometer is, however, indispensable for measuring the very low temperatures that must be reached before the ordinary gases can be liquefied under great pressure. Leslie's differential thermometer is virtually a U-tube terminated by two balls, whose air contents are separated by spirits of wine filling the bend. In its day it was perhaps the most delicate instrument of its kind; but thermo-electricity (see ELECTRICITY) has now provided us with much more delicate methods of measuring minute changes of temperature.

For the measurement of very high temperatures it is necessary to make use of the expansion of solids. Such an instrument is generally called a Pyrometer (see PYROMETRY). By suitable contrivances the very small changes of length for moderate ranges of temperature may be so magnified as to make such a metallic thermometer serviceable for ordinary purposes. Certain forms of self-registering instruments used in meteorology are constructed on this principle. A particularly delicate form of metallic thermometer is Bréguet's. It consists of two thin strips of differently expansible metals soldered together, bent into the form of a helix and fixed at its upper end. A horizontal index is attached to the lower end. When the temperature changes, the one strip expands or contracts more than the other and the helix twists or untwists through an angle nearly proportional to the change.

Thermopylæ (lit., 'the hot gates'), a famous pass leading from Thessaly into Locris, and the only road by which an invading army can penetrate from northern into southern Greece. It lies south of the present course of the river Spercheius, between Mount Œta and what was anciently an impassable morass bordering on the Maliac Gulf. In the pass are several hot springs, from which Thermopylæ probably received the first part of its name. Thermopylæ has won an eternal celebrity as the scene of the heroic death of Leonidas (q.v.) and his 300 Spartans in their attempt to stem the tide of Persian invasion (480 B.C.). Again, in 279 B.C., Brennus, at the head of a Gallic host, succeeded, through the same treachery that had secured a victory to Xerxes, in forcing the united Greeks to withdraw from the pass.

Thersites, son of Agrius, whom Homer, in the *Iliad*, makes the ugliest and most impudent of the Greeks before Troy. His name became a synonym for dastardly impudence. Later poets say he was slain by Achilles for calumniating him.

Thesaurus. See DICTIONARY.

Theseus, the great legendary hero of Attica, son of Ægeus, king of Athens, by Æthra, daughter of Pittheus, king of Troezen, at whose court he was brought up. On reaching manhood he proceeded to Athens, and was recognised by Ægeus as his son and successor. He captured the Marathonian bull, and next delivered Athens from its dreadful tribute of youths and maidens to the Cretan Minotaur, aided by the Cretan princess, Ariadne. When king he consolidated the twelve petty commonwealths of Attica into one state, reorganised the Pan-Athenaic festival, and founded the Isthmian games. He fought the Amazons, and carried off their queen, Antiope or Hippolyta, and after her death married Phædra. Further legends make him take part in the Argonautic expedition, join in the Calydonian hunt, help Peirithous and the Lapithæ against the Centaurs, and join in the attempt to rescue Proserpine from the lower world—an act of monstrous audacity for which he was kept there in close imprisonment till delivered by Hercules. Returning to Athens, he failed to re-establish his authority, and withdrew to Scyros, where he was treacherously destroyed by King Lycomedes; but his shade appeared to aid the Athenians in the fight at Marathon. His bones were removed to Athens in the year 469, but the tradition that the Theseum (see ATHENS, p. 544) marks their resting-place is not now accepted. See ÆGEUS, ARIADNE, MINOTAUR.

Thesiger. See CHELMSFORD.

Thesium, a genus of Santalaceæ (q.v.). *T. humifusum*, the Bastard Toadflax, the only British representative of the family, is parasitic on roots of pasture plants on chalky hills.

Thesmophoria. See MYSTERIES.

Thespis, the reputed founder (about 540 B.C.) of Greek dramatic representation. See THEATRE.

Thessalonians, THE EPISTLES TO THE. The first epistle to the Thessalonians is probably the earliest extant epistle of St Paul and is usually

dated 52–53. It was written a few months after Paul had been compelled by the politarchs to leave Thessalonica. While he was staying at Athens, Paul felt so much anxiety about the fate of the newly-founded church at Thessalonica in the persecution which had arisen, that he felt compelled to send Timothy to find out what had happened to the Christians in the city and to encourage them to stand firm in the faith. Timothy returned, and met Paul in Corinth with a four-fold message from Thessalonica: (*a*) The church had remained steadfast in the face of the most bitter opposition; (*b*) Paul's character had been traduced by his opponents, who had charged him with being a wandering sophist making money out of his profession; (*c*) some of the Thessalonian Christians had died in the interval, and the question had been raised, Would their death rob them of a share in the glory of the promised Parousia (second coming) of Christ? (*d*) there was a tendency on the part of some Christians in view of the Parousia to give up their ordinary avocations, and some amount of demoralisation had therefore crept into the church. It was as a reply to this four-fold message that Paul wrote the first epistle. The authenticity of the epistle is accepted by the majority of modern scholars. In former times its genuineness was challenged by the Tübingen school of criticism, chiefly on the ground that it lacked the characteristic marks of the theology of the later epistles; but this objection has been removed by later investigation, which has pointed out that the absence of these later characteristics 'may be explained partly by the circumstances which called for a letter of practical exhortation and not for theological discussion, and partly by the fact that the epistle was written before the theological controversy had become acute.' The epistle is accepted by scholars of such different schools as Pfleiderer, Holtzmann, Harnack, Jülicher, Zahn, Moffatt, and von Döbschutz.

The problems connected with the second epistle are more intricate. The crux of the difficulty centres round the eschatological passage in ii. 1–12, in which Paul details the circumstances which must precede the Parousia. Before the Parousia can take place, the 'apostasy' must occur, and the revelation of 'the man of sin.' At present, however, there is a restraining power at work which makes the revelation impossible. When the restraining power is withdrawn, the 'lawless one' will appear, and then Christ will return and slay him 'with the breath of his mouth.' Two sets of questions arise in connection with this statement: (1) There is first of all the problem, Could Paul have written such a paragraph in the light of the comparative absence of apocalyptic elements from his epistles and in the light of his teaching with regard to the Parousia in the first epistle? The first objection is not really valid—because there are apocalyptic passages in other epistles, especially in 1 Cor. xv., and in view of the general prevalence of the belief in Antichrist at the time, there is no ground for believing that such ideas could not have found their way into Pauline theology, especially in its early stages. The discrepancy between the two epistles is more apparent than real. The statement that the second epistle postpones the Parousia while the first regards it as imminent is not strictly true. 1 Thessalonians does not say that the Parousia will happen immediately. It lays the stress rather on its 'suddenness'—and there is nothing in 2 Thessalonians which denies that the Parousia is to come suddenly and unexpectedly. (2) There is the problem of interpretation. What is meant by 'the man of sin,' 'the apostasy,' and 'the restraining power'? There seems to be general agreement that by 'the restraining power' Paul means the Roman Empire, and especially the Emperor Claudius. The interpretation of 'the man of sin' is more in dispute. Opinion is divided as to whether Paul expected Antichrist to arise from the Jewish or the pagan world. Probably the latter view is to be preferred—and it is not impossible that there may be an allusion in the passage to Caligula's attempt to profane the temple and to the rising influence of the cult of Cæsar-worship. In view of the difficulties connected with this passage and other apparent differences between the two epistles, the genuineness of the epistle has been called in question by many modern scholars—including Weizsäcker, Holtzmann, Hollman, and Wrede, but its authenticity has been ably and earnestly defended by scholars of such different critical schools as Zahn, Wohlenberg, Jülicher, Bacon, McGiffert, and Moffatt. It is generally admitted that the trend of modern scholarship is increasingly in favour of recognising it, in spite of the difficulties, as a genuine Pauline epistle.

The best modern commentaries are by Jowett, Adeney (Cent. Bible), Milligan, Moffatt (Expositor's Greek Testament), Frame (International Critical Commentary), Schmiedel, and von Döbschutz. See also studies by Harnack (who thinks that 2 Thess. was addressed to the Jewish element in the church and 1 Thess. to the Greek), von Soden (1 Thess.), Spitta (2 Thess.); and Lake, *The Earlier Epistles of St Paul.*

Thessaloni'ka. See SALONIKA.

Thessaly, a district of Central Greece and the largest division of ancient Greece, lies south of Macedonia and east of Epirus, being separated from the latter by Mount Pindus, and from the former by the Cambunian Mountains, while the Maliac Gulf and Mount Œta bound it on the S. It is a vast plain shut in on every side by mountains; on the N. and W. by those already named, on the S. by Mount Othrys, and on the E. by Mounts Pelion and Ossa, the only opening being the Vale of Tempe in the north-east, between Ossa and Olympus. The passes through the mountains of Thessaly were of great importance in Greek history. There were four principal ones: one in the NE. beside Olympus, two in the W. through the Pindus chain, and one in the S. at Mount Othrys. The Thessalian plain is drained chiefly by the river Peneus (now *Salambria*) and its tributaries, and is the most fertile in all Greece. Thessaly was originally inhabited by so-called Pelasgians, who, however, were either expelled or reduced to slavery by Dorian immigrants from the more rugged region of Epirus about 1000 B.C. (see GREECE, Vol. V. p. 386). The Penestæ, descendants of the old inhabitants, held a position analogous to that of the Helots (q.v.) in Sparta. There were four districts—Hestiæotis, Pelasgiotis, Thessaliotis, and Phthiotis; Magnesia on the coast being a minor division. The government appears to have been oligarchical in the separate cities—of which Pharsalus, Larissa, Heracleum, and Pheræ were the chief—the principal power being in the hands of the two great families of the Aleuads and Scopads. About 374 B.C. Jason, tyrant of Pheræ, was elected Tagus (chief magistrate) of all Thessaly. The rule of Jason's successors became so unbearable that aid was sought from Philip of Macedon, who in 344 subjected the country to Macedonia. Thessaly remained subject to the Macedonian kings till the victory of Cynoscephalæ, in 197 B.C., brought it under the protection of Rome. Under the emperors Thessaly was united with Macedonia, but after Constantine it was a separate province. In 1204 A.D., with other portions of the Eastern empire, it came under the dominion of the Venetians, and in 1355 was taken by the Turks. The restoration to Greece of Thessaly south of the Salambria was

recommended by the Berlin Congress in 1878; and in 1881, after war between Greece and Turkey had seemed imminent, Turkey agreed to cede Thessaly south of the Salambria watershed, the most fertile section. The Turkish part was invaded by the Greeks in 1897. By the war of 1912–13 Greece obtained the whole of Thessaly. The only important seaport is Volo (pop. 30,000), situated on the Gulf of Volo; other towns are Larissa (21,000), and Trikkala (20,000).

Thetford, a market-town on the border of Norfolk and Suffolk, at the Thet's confluence with the Little Ouse, 31 miles SW. of Norwich and 12 N. of Bury St Edmunds. Doubtfully identified with the Roman Sitomagus, it was the capital of Saxon East Anglia, the seat from 1070 of a bishopric, transferred to Norwich in 1094; suffered much from the Danes between 870 and 1010; and in Edward III.'s time had eight monasteries and twenty churches (now only three). The steep Castle Hill, 100 feet high and 1000 feet in circumference, is one of the largest earthworks in the kingdom; and there are considerable remains of Roger Bigot's Cluniac priory (1104). The guildhall (1337) was rebuilt in 1680 and again in 1800; it was completely reconstructed in 1902. The boys' grammar-school (1566) was rebuilt in 1880; the girls' grammar-school was opened in 1886. The Ancient House, a picturesque timbered structure (15th century), was presented to the town in 1921 by Prince Frederick Duleep Singh (died 1926) for the purposes of a museum, and as such it was opened in 1924. The prince bequeathed his collection of 91 Norfolk and Suffolk portraits, and they have been hung in the guildhall. The industries include brewing, tanning, and the manufacture of farming machinery. From 1894 to 1926 it had a bishop suffragan under Norwich. 'Honest' Tom Martin, the antiquary, and Tom Paine were natives. First incorporated in 1573, Thetford returned two members till 1867 and one till 1868. Pop. 4706 (1921 census). See works by Martin (1779), A. L. Hunt (1870), and W. G. Clarke (*Guide to Thetford*, 3d ed. 1923).

Thetis, daughter of Nereus and Doris, was married against her will by the gods to Peleus, and became the mother of Achilles. She dwelt in the depths of the sea with her father, and had, like Proteus, the power of changing her shape.

Theuriet, ANDRÉ, French poet and romancer, was born in 1833 at Marly le Roi, near Paris, studied law in Paris, and received in 1857 a place in the office of the minister of finance. In 1867 appeared *Le Chemin des Bois*, a volume of poems full of the charm of woodland. Later poems were the so-called epic *Les Paysans de l'Argonne, 1792* (1871), and *Le Bleu et le Noir* (1872), styled poems of real life. But Theuriet is best known by his novels, which are ever touched with melancholy and sometimes recall in their feeling for the poetic sides of nature the subtler touch of George Sand. They include *Mademoiselle Guignon* (1874), *Le Mariage de Gérard, Une Ondine* (1875), *Raymonde* (1877), *Le Filleul d'un Marquis* (1878), *Le Fils Maugars* (1879), *La Maison des deux Barbeaux* (1879), *Sauvageonne* (1880), *Tante Aurélie* (1884), *L'Amoureux de la Préfète* (1888), *Reine des Bois* (1890), *Nos Enfants* (1892), *La Chanoinesse* (1893), *Flavie* (1895), *Villa tranquille* (1899), *Le Manuscrit du chanoine* (1902). Theuriet was admitted to the Academy in 1896, and died 23d April 1907.

Thian Shan. See TIAN SHAN, ASIA.

Thibault, JACQUES ANATOLE. See FRANCE (ANATOLE).

Thibaut, ANTON FRIEDRICH JUSTUS, German jurist, was born at Hameln (Hanover) in 1774, and studied law at the universities of Göttingen, Königsberg (under Kant), and Kiel. He became professor of civil law at Kiel in 1798, and subsequently filled similar appointments at Jena and at Heidelberg, where he died in 1840. Thibaut was one of the most prominent civilians of his day, and his *System des Pandektenrechts* (1803) was long a standard work. Important also were his *Versuche über einzelne Theile der Theorie des Rechts* (1798), *Theorie der logischen Auslegung des römischen Rechts* (1799), *Civilistische Abhandlungen* (1814); and a work on old music, *Über die Reinheit der Tonkunst* (1824).

Thibaut IV., count of Champagne and king of Navarre, was the son of Thibaut III. of Champagne and Blanche of Navarre, sister of Sancho VII., king of Navarre (whom he succeeded in 1234). He led a crusade to Palestine in 1239, but was unsuccessful, and abandoned it the following year. He died in 1253. Thibaut was one of the foremost French lyricists of the 13th century, and his fame passed into Italy, for both Dante and Petrarch praised him. His poems, over sixty in number, are full of melody and grace, and are mostly love-songs, though his crusade songs and *jeux-partis* (debating songs) are important.

Thibet. See TIBET.

Thick-knee (*Oedicnemus*), a genus of birds, typical of the family Oedicnemidæ or Stone-plovers, connecting Plovers and Bustards. They are semi-nocturnal birds (as the large eyes suggest), long-legged quick runners, strong in flight, feeding on small animals such as worms, slugs, insects, and even field-mice. Two stone-coloured eggs are laid on the ground or among stones. The loud whistling cry, chiefly heard after dusk, resembles that of the Golden Plover. The family is widely represented, chiefly in the temperate and tropical parts of the Old World and in Central and South America; it includes the Australian Thick-knee (*Burhinus grallarius*) and the Large-billed Thick-knees (*Orthorhamphus magnirostris*) from the Malay Archipelago to Australia. The only European form is *Oedicnemus scolopax*, a summer visitor to Britain, occasionally spending the winter in southern counties. It is known as Stone-curlew, Norfold Plover, or Thick-knee, the last name referring to a swelling at the knee-joints in young birds. It frequents chalk downs, open heaths, and warrens. Its length is 16 inches, its colour light-brown and buff, and its general appearance like a large plover.

Thielt, a town of Belgium, 18 miles SE. of Bruges by rail, with manufactures of lace, linens, and oil. Pop. 11,000.

Thienen. See TIRLEMONT.

Thiepval, once a small village of NE. France, situated in the valley of the river Ancre, 20 miles SSW. of Arras. A German stronghold in the Great War, it was the scene of desperate fighting during the summer of 1916.

Thierry, JACQUES NICOLAS AUGUSTIN, French historian, born at Blois, 10th May 1795. His father, who became town-librarian, was his first instructor; while yet young he obtained a 'bourse' at the college of his native town, and in 1811 entered the *École Normale*. In 1814 he completed his courses and joined the ranks of the Parisian Liberals. Soon after appeared his first book, entitled *De la Réorganisation de la Société Européenne*. In this and subsequent treatises he considered the notion of one government for the whole of Europe without the destruction of national characteristics. These works were inspired by Saint-Simon (q.v.), whose secretary Thierry became, and with whom he lived for three years. In 1817, however, he and Saint-Simon no longer agreed; and Thierry joined Comte, who had not then fallen under the influence

of Saint-Simon (see COMTE). Jointly with Dunoyer Thierry aided for three years in the *Censeur Européen*, where he found plenty of practice as a student and exponent of history. In 1820, however, he contributed his 'Letters on the History of France' to the *Courrier Français*, and showed a new influence acting on his own mind, and destined in turn to act largely on his future readers; bringing history, in fact, to practical application. Thierry dwelt on the principle of race, and attributed the establishment of the feudal system (with the evils which he ascribed to it) to the subjugation of western Europe by the Germans and Scandinavians. In 1825 he published his masterpiece, the *Conquest of England*, followed in 1827 by a new series of 'Letters on History'; but the labour cost him his eyesight. In 1828 he went to the south of France for the benefit of his health; and here he met Julie de Quérengal, a lady of considerable literary accomplishment, whom he married. In 1835 he became librarian at the Palais Royal, and published his *Dix Ans d'Études*, the introduction to which is famed for its eloquence, and in 1840 his *Récits des temps mérovingiens*. In 1840 he received the 'Gobert' prize, which the Academy made perpetual in his favour. His last work was on the *Tiers État*, published in 1853; and three years later his laborious life was closed by paralysis, 22d May 1856. He may be called the father of romantic history, and a disciple of the school of Sir Walter Scott, whom he regarded as the 'great master of historical divination'; he also described himself as indebted for inspiration to Chateaubriand's *Martyrs*. After Michelet he is the greatest artist of his class. See monographs by Aubineau (2d ed. 1879) and A. A. Thierry (Paris, 1922).—A younger and less talented brother, AMÉDÉE SIMON DOMINIQUE THIERRY (1797–1873), was likewise a Liberal and a historian, his chief works histories of Gaul and Attila.

Thiers, a manufacturing town in the French dept. of Puy-de-Dôme, on the right bank of the Durole, 23 miles ENE. of Clermont by rail. Its manufactures of cutlery, paper, and playing-cards gave to the town a certain importance in the 17th century, and it is still important for its cutlery and 'Toledo' blades. Pop. 16,000.

Thiers, LOUIS ADOLPHE, French historian, politician, and patriot, was born at Marseilles on April 16, 1797. His father, who seems to have belonged to a family in decayed circumstances, was a locksmith. Through the influence of his mother, who was a Chénier, he received a good education, first at the Lycée in his native city, and subsequently (1815) at Aix, whither he was sent to study law. At Aix he made the acquaintance of Mignet, cultivated literature rather than the law, and won a prize for a dissertation on Vauvenargues. Called to the bar at the age of twenty-three, he set off for Paris in the company of Mignet. His prospects did not seem brilliant, and his almost ludicrously squat figure and plain face were not recommendations to Parisian society. His industry and belief in himself were, however, unbounded, and an introduction to Lafitte, of the *Constitutionnel*, then the leading organ of the French Liberals, gave him the chance of showing his capacity as a public writer. His articles in the *Constitutionnel*, chiefly on political and literary subjects, gained him the entry into the most influential *salons* of the opposition. At this time he made the acquaintance of Talleyrand, Casimir Périer, the Comte de Flahault, and Baron Louis the financier. Meanwhile he was rapidly—indeed too rapidly—preparing his *Histoire de la Révolution Française*. The first two volumes—there were ten in all—appeared in 1823. This work, although it has been demonstrated to be very untrustworthy and inaccurate, more especially in its estimates of persons, gave its author a prominent place among French politicians and men of letters. About this time, too, the gift by his admirer, Cotta, the German publisher, of a share in the *Constitutionnel* raised him to comparative affluence. In January 1830 he, along with Armand Carrel, Mignet, and other friends, started the *National*, and in its columns waged relentless war on the Polignac administration. The ministry met the opposition it had provoked by the Ordonnances of July. Among the other repressive measures that were taken was the sending of a commissary of police to the office of the *National* interdicting its publication. Its conductors, with Thiers at their head, defied the ministry, and the result was the revolution which drove Charles X. into exile.

Thiers now entered on an active career as a politician. He was elected deputy for the town of Aix, and was appointed Secretary-general to the minister of Finance. His first appearance in the Chamber of Deputies gave no promise of his subsequent distinction. His diminutive person, his small face, encumbered with a pair of huge spectacles, and his whole exterior presenting something of the ludicrous, the new deputy, full of the impassioned eloquence of the revolutionary orators, attempted to impart the thrilling emotions affected by Mirabeau. The attempt provoked derision; but soon subsiding into the oratory natural to him—simple, easy, rapid, anecdotic—he became one of the most formidable of parliamentary speakers. Almost from the moment of his entrance into public life he and Guizot stood forth in opposition to each other as the champions of Radicalism and Conservatism respectively. But he was a staunch Monarchist, and for a time a favourite with Louis-Philippe. In 1832 he accepted the post of minister of the Interior under Soult, exchanging it subsequently for the ministry of Commerce and Public Affairs, and that in turn for the Foreign Office. He was universally regarded as a stronger man than any of his chiefs during this period; but his public and private actions alike were always marked by a certain fussy quarrelsomeness which prevented him from being ever accounted a statesman of the first rank. The 'spirited foreign policy,' calculated above all things to precipitate a quarrel between France and Great Britain, of which for many years he was the chief advocate, is now allowed to have been a great, and might have been a fatal, mistake. In 1836 he became President of the Council, but in August of the same year he resigned office and became the leader of the opposition. In 1840 he was again summoned to office as President of the Council and Foreign Minister. In a few months he was a terror to the peace of Europe. He refused Lord Palmerston's invitation to enter into an alliance with Britain, Austria, and Prussia, for the preservation of the integrity of the Ottoman Empire, from a sympathy with the principles which dictated the first Napoleon's invasion of Egypt and Syria, and a desire to accomplish by diplomacy with Mehemet Ali what Bonaparte had endeavoured to effect by force of arms—the supremacy of France in these regions. He talked menacingly of setting aside the treaties of 1815 and of extending the French frontier to the Rhine, and is said to have actually spent £8,000,000 on military and naval demonstrations. On his application to the British government, Napoleon's remains were removed from St Helena and brought to the Invalides, 15th Dec. 1840. Meanwhile Thiers, unable to agree with the king, had resigned (29th Oct.), and for years took little part in public affairs. He now returned to the study of French history. The first volume of

his *Histoire du Consulat et de l'Empire* appeared in 1845; it was not completed till 1860. This, the most ambitious of all Thiers's literary enterprises, must be considered a large rather than a great work. It is a monument to its author's industry in reading, and rises here and there to rhetorical brilliance. But that it is inaccurate and unfair has been admitted even by French critics. Thiers greatly overrated Napoleon, and probably to his own hurt.

Thiers was not one of the promoters of the revolution which in 1848 drove Louis-Philippe from the throne. On the contrary, he would, as prime-minister summoned at the eleventh hour, have prevented it if he could. He accepted its consequences in the form of the Republic. He voted for the election of Prince Louis Napoleon as its president. This action brought him much vituperation and ridicule from former political friends. But whatever may have been the motive that inspired it, it certainly did not help him at the time of the *coup d'état* of 1851; he was arrested, imprisoned in Mazas, and banished. Next year, however, he was allowed to return from Switzerland to France. For eight years he was occupied with his *History of the Consulate and Empire*. He re-entered the Chamber in 1863, having been elected Liberal deputy for the department of the Seine in opposition to the Imperialist candidate. Till the fall of the Second Empire he was regarded as the ablest and most formidable of its more moderate and parliamentary opponents. His speeches in the years between 1863 and 1870 were filled with taunts of the Empire on account of the loss of prestige which had marked its history; and these must not be left out of account when blame has to be apportioned among the authors of the war of 1870, although he opposed it when declared by the Ollivier ministry, and predicted defeat.

The collapse of the Second Empire, however, enabled Thiers to play the greatest of all his parts, that of 'liberator of the territory.' He declined, after Sedan, to become a member of the Government of National Defence; but he voluntarily undertook diplomatic journeys to Great Britain, Russia, Austria, and Italy, on behalf of France—a self-imposed mission in which he was unsuccessful, but by which he obtained the gratitude of his countrymen. He was largely instrumental in securing for his country that armistice which permitted the holding of a national assembly with a view to the negotiation of a peace. Twenty constituencies chose him as their deputy. Electing to sit for Paris, he was made head of the provisional government. He had great difficulty in persuading his colleagues of the Assembly, and his countrymen generally, to agree to peace on terms that were practically dictated by Germany. But he succeeded; peace was voted March 1, 1871. No sooner had he accomplished this task than he was face to face with the sanguinary madness of the Commune. But this difficulty also he set himself to surmount with characteristic energy, and succeeded. When the seat of government was once more removed from Versailles to Paris, Thiers was formally elected (August 30) president of the French Republic. He held office only till 1873, but during this brief period he was probably of greater service to his country than at any previous time in his life. He was mainly instrumental in securing the withdrawal of the Germans from France, and the payment of the war indemnity, and in placing both the army and the civil service on a more satisfactory footing. But in course of time the gratitude of the country exhausted itself, and Thiers, who was old-fashioned in many of his opinions, and as opinionative as he was old-fashioned, did not make any new friends. He was specially detested by the Extreme Left, whose chief, Gambetta, he styled a *fou furieux*. As a result, a coalition of Reactionaries and Radicals was formed expressly, as it seemed, to harass him, and even in the beginning of 1872 he tendered his resignation. It was not accepted; and his opponents for a time suspended their intrigues. They were revived, however, in 1873, and resolved themselves into a resolute effort to limit the powers of the president. This Thiers stoutly resisted. He made an appeal to the country, but this course did not increase the strength of his following. Finally what he interpreted as a vote of no confidence was carried (May 24) by a majority of sixteen. He resigned, and his place was taken by Marshal MacMahon. He lived four years longer, and never ceased to take an interest in politics. In 1877 he took an active part in bringing about the fall of the ministry presided over by the Duc de Broglie. He now leaned to the side of the Left, and was reconciled to Gambetta, and he might once again have played a prominent part in politics had he not died of apoplexy on September 3, 1877, at St Germain-en-Laye. The 19th century produced greater statesmen and much greater historians than Thiers. Yet he was a man of indomitable courage, and his patriotism, if narrow and marred with Chauvinism, was deep and genuine. He was perhaps the most successful of the large class of journalist-politicians that France has produced, and that he was at least a personal power in literature was evidenced by the great influence which he wielded in the Academy, of which he became a member in 1834.

Many editions of his chief works have been issued, his parliamentary speeches fill a score of volumes, and studies of him are innumerable, such as those of Jules Simon, Charles de Mazade, Paul de Rémusat (trans. 1892), and President Poincaré (1913). See also J. M. S. Allison, *Thiers and the French Monarchy, 1797–1848* (1926).

Thieves' Latin. See SLANG.

Thing, an Old English and Old Norse word (mod. Scand. *ting*) for an assembly, council, parliament or the like. It thus came to mean affair, or business, and so developed the very generalised meaning that the word has in modern English. Its original form is preserved in place-names in those parts of Britain where the Northmen settled, as *Dingwall*.

Thiocyanates are prepared by fusing cyanides with sulphur. These salts do not possess the poisonous character of the cyanides. *Thiocyanate of potassium*, KCNS, is anhydrous, but very deliquescent, and occurs in long streaked colourless prisms, somewhat resembling nitre both in appearance and taste; it is extremely soluble in water, and fuses on the application of a gentle heat. The thiocyanate is a white powder which possesses the property of swelling or growing in size to an almost incredible degree when moderately heated. The resulting mass often assumes a most fantastic shape, and is sufficiently coherent to retain its form; it is of a yellow colour externally, but black within. It is this thiocyanate which is the ingredient of the toy known as 'Pharaoh's serpents.' Each serpent consists of a little cone of tinfoil, resembling a pastille in shape, and filled with the above-named compound. On lighting the cone at the apex, there begins to issue from it a thick serpent-like coil, which continues twisting and increasing in length to an extraordinary degree, the serpent-like shape resulting from the salt being burned in the tinfoil cone.

Thionville (Ger. *Diedenhofen*), a fortified town of Lorraine (Moselle), 18 miles N. of Metz by rail,

an important railway junction and centre of the Lorraine iron industry. Taken by Condé in 1643, it fell with Lorraine to France, but was besieged, bombarded, and taken by the Germans, 9th–25th Nov. 1870. Pop. 13,400.

Thiosulphates. See SULPHUR.

Third, in Music. See INTERVAL.

Thirlage, an old Servitude (q.v.), or rather service, enjoyed by the proprietor of a mill over specified lands 'thirled' to it, whereby the occupiers of the lands were bound to have their grain ground at that mill, and to pay as 'multure' or duty a certain proportion of the grain ground, varying from a thirtieth to a twelfth of the corn ground. The possessors of the astricted lands were called *suckeners;* the multure paid by those who were not bound, but used the mill, was out-sucken multure. An Act of 1779 (39 Geo. III. c. 55) provided for thirlage being commuted for an annual payment, and since that date this class of burden has tended to disappear. Such a servitude or easement was rare in England.

Thirlmere, a narrow sheet of water in the heart of the Lake District (q.v.), lying 533 feet above sea-level, and 3 miles long by ¼ mile wide, between Derwentwater and Grasmere. Since 1894 it has served as a water-supply for Manchester (q.v.); see also AQUEDUCT.

Thirlwall, CONNOP, a great English bishop and historian of Greece, was born, of good Northumbrian stock, at Stepney in Middlesex, January 11, 1797. He was a child of almost unexampled precocity, learned Latin at three, read Greek at four, and at eleven published *Primitiæ* (1809), a volume of poems and sermons which in later years he did his best to suppress. He next went to Charterhouse, where Grote, Julius Hare, and Henry Havelock were among his schoolfellows; entered Trinity College, Cambridge, in October 1814, and in the February of the following year carried off the Craven scholarship, which only Porson and Professor Kennedy have done as freshmen. That same year he gained the Bell scholarship; in 1818 he graduated as 22d senior optime—there being yet no classical tripos—but his real rank was better marked by the first Chancellor's classical medal. In October he was elected to a Trinity fellowship, and next spent about a year on the Continent, making fast friendship with Bunsen at Rome. He entered as a law-student at Lincoln's Inn in February 1820, and soon after joined the famous debating society that included Mill, Macaulay, Charles Austin, Romilly, the two Bulwers, Samuel Wilberforce, and later Maurice and John Sterling. He was called to the bar in 1825, but the natural bent of his mind prevailed, and in 1827 he took orders.

Already in 1825 he had translated Schleiermacher's *Essay on St Luke* and written an introduction—a remarkable performance for a barrister. His return to Cambridge was marked by the commencement, in conjunction with his dear friend Julius Hare, of a translation of Niebuhr's *History of Rome* (vol. i. 1828; ii. 1832). Their famous *Philological Museum* (1831–33) saw only six numbers, but contained some remarkable papers, among them Thirlwall's 'On the Irony of Sophocles.' Besides all this he took a full share of college and clerical work—the latter at Over, 8 miles from Cambridge. In 1834 he signed the petition in favour of the admission of dissenters to academical degrees, and in May put forth a weighty pamphlet in defence of the measure. Thirlwall pointed out with characteristic plainness the perfunctory nature of the religious education that existed, and expressed the belief that compulsory chapel services were 'a hindrance and not a help to the religious life.' The Master of the College, Dr Chr. Wordsworth, now called on him to resign the assistant-tutorship, which he did at once, though under protest. Almost immediately he was presented by Lord Brougham to the quiet Yorkshire living of Kirby-Underdale. Here he wrote for *Lardner's Cyclopædia* his *History of Greece* (8 vols. 1835–47; improved ed. 1847–52). In 1840 Lord Melbourne raised Thirlwall to the see of St David's, and within six months thereafter he preached in perfect Welsh. For thirty-four years he laboured with the utmost diligence in his diocese, building churches, parsonages, and schools, and augmenting poor livings (to the extent of £30,000 from his own pocket); and, though he wrote no great work, his eleven Charges remain an enduring monument of breadth of view and soundness of judgment in reference to all ecclesiastical controversies of one generation. His Primary Charge (1840) was a catholic-spirited apology for the Tractarian party then being vehemently *charged* against by almost every bishop and archdeacon in England. In later days (Charges of 1866 and 1872) he modified greatly his approval of the spirit that animated the new party, but his grave warnings and protests against their Romanising tendencies rise characteristically into a serenely judicial region far above the heated and vulgar atmosphere of polemical debate. Thirlwall joined in the encyclical letter censuring *Essays and Reviews*, but was one of the four bishops who refused to inhibit Bishop Colenso. He supported the Maynooth grant, the admission of Jews to parliament, and alone amongst the bishops voted for the disestablishment of the Irish Church, although he would have preferred to see a measure of concurrent endowment. He was appointed chairman of the Old Testament Revision Committee, and resigned his see in May 1874, retiring to Bath, where he died, July 27, 1875.

Thirlwall's massive understanding, vast learning, and fundamental breadth and fairness of mind were a combination of enormous value to the Church of England; and no words of epitaph could have been found better than those inscribed on the granite slab over his grave in Westminster Abbey, where he sleeps side by side with his brother-historian Grote: 'Cor sapiens et intelligens ad discernendum judicium.' He never married, but lived throughout life in the midst of his nephews and their children, and his love for cats rivalled Southey's. And few men have left a more pleasing though unconscious monument of noble character than the beautiful series of letters to a young lady—the *Letters to a Friend*, edited by Dean Stanley in 1881.

His *Remains, Literary and Theological*, fill three volumes (vols. i. and ii. Charges, 1877; vol. iii. Essays, Speeches, Sermons, 1878), edited by Dean (Bishop) Perowne. The *Letters, Literary and Theological*, were edited by Dean Perowne and the Rev. Lewis Stokes in 1881. See the *Edinburgh Review* for April 1876.

Thirsk, a town in the North Riding of Yorkshire, in the Vale of Mowbray, on the Cod Beck, an affluent of the Swale, 23 miles NNW. of York. It has a fine Perpendicular church, and carries on manufactures of agricultural implements and saddlery. Thirsk returned two members to parliament till 1832, and then one till 1885.

Thirst is a well-known sensation, resulting from a peculiar state of the system, but especially of the mucous membrane of the fauces, usually caused by an insufficient supply of liquid. In cases of extreme thirst there is a peculiar sense of clamminess in the mouth and pharynx, which, with the other disagreeable feelings, is almost immediately relieved by the introduction of liquid into the stomach, where it is absorbed by the veins. That the thirst

is relieved by the absorption of the fluid, and not by its action as it passes over the mucous membrane, which seems to suffer most, is proved by the facts (1) that injection of liquids into the stomach through a tube (in cases of wounded œsophagus), and (2) the injection of thin fluids, as water, into the blood, remove the sensation of thirst. An excessive thirst is often an important morbid symptom. It may arise from two very opposite conditions—one a condition of excitement, and the other of depression. Whenever the blood is in a state requiring dilution, and is too stimulating, as in fevers and inflammations, there is thirst; and, again, in cases of excessive secretion and exhaustion, as for example in cholera and in the two forms of diabetes, there is great thirst, which sometimes also attends the lowest stages of prostration in malignant diseases. When there is a great loss of the watery portion of the blood by profuse perspiration, caused not by disease, but by hard bodily exercise in a hot atmosphere, as in the case of coal-whippers, mowers and reapers, &c., there is always great thirst, and from two to four gallons of beer or cider a day may, in these cases, be taken with apparent impunity. Cold tea, without milk or sugar, is one of the most satisfying drinks in these circumstances. Independently of disease, great thirst may be induced by the use of salted meat or fish, highly-peppered curries, and other stimulating dishes, the ingestion of malt liquors drugged with salt and more pernicious matters, or of gin strengthened with sulphuric acid, &c.

Thirty-nine Articles. See ARTICLES.

Thirty Years' War, a war or rather an uninterrupted succession of wars (1618–48) in Germany, in which Austria, most of the Catholic princes of Germany, and Spain were engaged on the one side throughout, but against different antagonists. This long-continued strife had its origin in the quarrels between the Catholics and Protestants of Germany, and few wars in modern times have caused more slaughter, misery, ruin, and demoralisation. The severe measures taken by the emperor, the head of the Catholic party, against the Protestants' religion led also to restrictions on their civil rights; and it was to protect their political as well as their religious liberties that the Protestants formed a union in 1608. The rival union of the Catholic powers followed in 1609. (1) *Bohemian War* (1618–20). The withdrawal of concessions to the Protestants of Bohemia by the Emperor Rudolf II. led to an insurrection in Prague and the election of Frederick V., the Elector Palatine, as king of Bohemia (1619); and Count Thurn repeatedly routed the imperial troops. But on 8th November 1620 a well-appointed army of 30,000, under Duke Maximilian of Bavaria, totally routed Frederick's motley array at the White Mountain near Prague, while an army of Spaniards under Spinola ravaged the Lower Palatinate. The Bohemians were now subjected to the most frightful tyranny and persecution.

(2) *War of the Palatinate* (1621–24). But the indomitable pertinacity and excellent leadership of three famous partisan leaders, Count Mansfeld, Christian of Brunswick, and George Frederick, margrave of Baden-Durlach, who ravished the territories of the Catholic league, did much to equalise the success of the antagonistic parties. Tilly, however, aided by a Spanish force, eventually overpowered them. Here the war might have ended; but the fearful tyranny of Ferdinand over all the Protestants in his dominions (Hungary excepted) drove them to despair, and the war advanced to its third phase.

(3) *Danish-Saxon War* (1624-30). Christian IV. of Denmark, smarting under some injuries inflicted on him by the emperor, and aided by a British subsidy, came to the aid of his German co-religionists in 1624, and, being joined by Mansfeld and Christian of Brunswick, advanced into Lower Saxony. But when, by the aid of Wallenstein, a powerful army had been obtained, and the leaguers under Tilly, in co-operation with it, had marched northwards, the rout of the Danes by Tilly at Lutter, and of Mansfeld by Wallenstein at Dessau, again prostrated the Protestants' hopes in the dust; yet a gleam of comfort was obtained from the victorious raid of Mansfeld through Silesia, Moravia, and Hungary. The combined imperialists and leaguers meantime had overrun North Germany and continental Denmark, and ultimately compelled King Christian to conclude the humiliating peace of Lübeck.

(4) *Swedish-German War* (1630–36). Ferdinand, not content with a still more rigorous treatment of the Protestants, and the promulgation of the *Restitution Edict*, which seriously offended even the Catholics, stirred up Poland against Sweden, and insulted Gustavus Adolphus; and the war entered its fourth stage on the landing of the Swedes at Usedom (June 1630), and their conquest of Pomerania and Mecklenburg. Gustavus induced the Elector of Brandenburg to aid him; and though unable to save Magdeburg, he marched to join the Saxons, completely routed Tilly at Breitenfeld (1631), victoriously traversed the Main and Rhine valleys, defeated and mortally wounded Tilly on the Lech (1632), and entered Munich. By the judicious strategy of Wallenstein, who had retired from the conflict but joined in again at the entreaty of the emperor, he was however compelled to retire on Saxony, where he gained the great victory of Lützen (1632); but his death there, depriving the Protestants of the only man who could force the confederate powers to preserve unity of action, was a severe blow to their cause; though the genius and indefatigable zeal of his chancellor, Oxenstjerna, and the brilliant talents of the Swedish generals, preserved the advantages they had gained, till the crushing defeat of Bernhard of Weimar at Nördlingen (1634) again restored to the emperor a preponderating influence in Germany. Saxony now made peace at Prague (1635).

(5) *Swedish-French War* (1636–48). Final success now appeared to demand only one more strenuous effort on the part of Austria; but Oxenstjerna, resolved to preserve to Sweden her German acquisitions, propitiated Richelieu (q.v.) by resigning to him the direction of the war; and the conflict advanced into its final and most extended phase. The emperor, allied with the Lutherans, was now also assailed through his ally, Spain, who was attacked on her own frontier, in the Netherlands, and in Italy; Bernhard of Weimar, fighting independently, opposed the leaguers; while the Swedes, under Banér, held North Germany, and by frequent flying marches into Silesia and Bohemia distracted their opponents, and prevented them, after their successes over Duke Bernhard, from proceeding with the invasion of France. The great victory of Banér over the Austrians and Saxons at Wittstock (1636) restored to Sweden the victor's wreath; and from this time, especially under Torstensson and Königsmark, the Swedes were always successful, adding a second victory of Breitenfeld (1642) and one at Jankau (1645) to their already long list of successes, and carrying devastation and ruin even to the gates of Vienna. On the Rhine the leaguers at first had great success; but after the Spanish power had been thoroughly broken in the Netherlands by Condé the French were reinforced on the Rhine, and under Condé and Turenne rolled back the leaguers through the Palatinate and Bavaria, and avenged at Nördlin-

gen (3d August 1645) the former defeat of the Swedes. The emperor was now deserted by all his allies except the Duke of Bavaria, whose territories were already mostly in the hands of Turenne and Wrangel; and a combined invasion of Austria from the west and north was on the point of being executed when after seven years of diplomatic shuffling, the Peace of Westphalia (q.v.) put an end to this terrible struggle.

See the articles on the principal leaders in the struggle, especially Gustavus Adolphus and Wallenstein, and works there cited; books by A. W. Ward (1869), S. R. Gardiner (1874), H. G. R. Reade (1925), the volume in the 'Cambridge Modern History' (1906); and German works by Schiller, Söltl, Barthold, Gindely, Klopp, Ritter.

Thisbe. See PYRAMUS.

Thistle, a general name for a group of plants of the Compositæ, found in most of the temperate and cold parts of the northern hemisphere.

Stemless Thistle.

Herbaceous plants of considerable size, they have spinous leaves, imbricated involucres, heads of tubular hermaphrodite flowers (very rarely dioecious), the stamens free, pappus deciduous. The flowers are generally purple, sometimes white or yellowish. The genus Carduus of some botanists is by others divided into three: Cnicus (with one species *C. benedictus*), Cirsium (including those that have a feathery pappus), and Carduus (with bristly pappus). Thus the difficulty of distinguishing the many species is increased by confusion of names. However, the specific names are commonly alike, whatever the generic may be, varying only to suit the neuter gender of Cirsium or the masculine of Cnicus or Carduus. *Carduus nutans*, the Musk thistle, has large dropping heads that smell of musk. The creeping Plume Thistle (*Cirsium arvense*), a species about 1 to 3 feet high, with creeping roots, pinnatifid leaves and numerous dioecious flowers, is a very troublesome weed in fields, very common in Britain, and now too common, not only in Europe where it is indigenous, but in America (where it is called Canada Thistle) and other countries to which it has found its way; in Australia the thistle has become a serious plague. *Cirsium lanceolatum* (the Spear or Bur Thistle) and *C. palustre*, both common British plants, are also troublesome weeds. *Cirsium oleraceum* is a native of the north of Europe, but not of Britain. The Blessed Thistle (Carduus benedictus of the pharmacopœias, *Cnicus benedictus* of modern botanists) is a native of the Levant and of Persia, resembling in appearance a Centaurea, with yellow flowers enveloped in leaves, and abounding in a gossamer-like down; it is a powerful laxative-tonic medicine. The Cotton Thistle (Onopordon) is a distinct genus, known by its receptacles being destitute of bristles, and coarsely and deeply honeycombed. The pappus is rough. The Common Cotton Thistle (*O. Acanthium*), a native of Europe, is found in England. It is doubtful if it be a true native of Scotland; nevertheless it is generally called by gardeners and others the Scotch Thistle. The national emblem of Scotland is not, in all probability, any one species of thistle in particular, as botanically distinguished; though the Stemless Thistle (*Carduus* or *Cnicus acaulis*, or *Cirsium acaule*) is in many districts of Scotland so designated. The cotton thistle has large elliptic leaves, and a broadly-winged stem. The young fleshy root and stem are boiled and eaten. Plants of the genus Silybum, and of the genus Echinops, which belongs to a very different section of the Compositæ, are often to be seen in flower-gardens, where they are known as Thistles. The Milk Thistle (*Silybum Marianum*), a biennial, native of Britain and other parts of Europe, attains a height of 4 to 6 feet, and is remarkable for the milky veins of its large waved leaves. Its blanched leaves are used in winter salads; they may also be used as a boiled vegetable, along with the young stalks, and the root is used as salsify. The plant used to be cultivated. The name is also, generally with some addition, very often bestowed upon many plants which have little resemblance to any of these, except in their spinous character. *Centaurea Calcitrapa* is the Star Thistle (see CENTAUREA); the Jersey Thistle is *Centaurea isnardi;* the Fuller's Thistle is Teasel (q.v.); Torch Thistle, *Melocactus;* and the Golden Thistle, *Protea Scolymus.* And see CARLINE THISTLE, SOW-THISTLE, SAFFLOWER, BURDOCK, &c.

Thistle, ORDER OF THE, called also the Order of St Andrew, is of no very ancient date. The earliest known mention of the thistle as the national badge of Scotland is in the inventory of the effects of James III., who probably adopted it as an appropriate illustration of the royal motto, *In defence.* Thistles occur on the coins of James IV., James V., Mary, and James VI.; and

Star, Collar, and St Andrew of the Order of the Thistle.

on those of the last they are for the first time accompanied by the motto, *Nemo me impune lacesset.* A collar of thistles appears on the gold bonnet-pieces of James V. of 1539; and the royal ensigns, as depicted in Sir David Lindsay's armorial

register of 1542, are surrounded by a collar formed entirely of gold thistles, with an oval badge attached. This collar, however, was a mere device until the institution, or, as it is generally but inaccurately called, the revival of the order of the Thistle by James VII. (II. of England), which took place on 29th May 1687. Statutes were issued, and eight knights nominated by James; but the patent for the institution of the order never passed the Great Seal. After falling entirely into abeyance during the reign of William and Mary, the order was revived by Queen Anne, 31st December 1703, and the statutes then issued still, with some changes, govern the order. By them the word '*lacesset*' in the motto was altered to '*lacessit.*' The number of knights was originally fixed at twelve, a number raised by George IV. in 1827 to sixteen, at which it now stands. The officers of the order are the Chancellor, the Dean, the Secretary, Lord Lyon King-of-arms, and the Usher of the Green Rod. The Thistle Chapel, in St Giles', Edinburgh, was inaugurated in 1911.

Thistlewood. See CATO STREET CONSPIRACY.

Thlaspi. See PENNYCRESS.

Tholen, an island forming part of the Dutch province of Zeeland. There is a small town of Tholen.

Tholuck, FRIEDRICH AUGUST, theologian and preacher, was born at Breslau, 30th March 1799, and studied at Breslau and Berlin. Oriental languages first attracted him, and he somewhat paradoxically maintained the superiority of Mohammedanism to Christianity. The influence of Neander and of a pious nobleman, Von Kottwitz (a Moravian Brother), produced a marked change in his feelings; and by 1825 he was a champion of that fervid but catholic evangelical Christianity to which all his later life, lectures, sermons, and published books were a testimony. In 1824 he was appointed extra-ordinary professor of Oriental Languages at Berlin, as successor to De Wette; in 1826 he was called to Halle as ordinary professor of Theology; and there, save for a year and a half (1827–28) spent by him as chaplain to the Prussian embassy at Rome, where Bunsen was ambassador, he spent the rest of his lovable and laborious life. At first he had difficulties in Halle, the tone of the university being strongly Rationalist, and his colleagues, Gesenius and Wegscheider, were distinctly hostile to Tholuck's pietism; but ultimately he profoundly influenced the whole university in a direction favourable to devoutness, if not to old-fashioned orthodoxy. And his personal relations with the students instilled evangelical fervour into many successive generations of theological students from all parts of Germany, from Britain, and from America. Theologically he was not a strait-laced orthodoxist; he made very considerable concessions to criticism, and his line of thought was highly eclectic, containing elements from Pietism and Moravianism, from Hegel and Schleiermacher, but more still from the pectoral theology of Neander. As a writer and commentator he was rather suggestive and pregnant than profound or exhaustive. Of German theologians he is probably the one who has been most heartily accepted by English-speaking Protestants. He was a powerful preacher, and continued to lecture in spite of advancing years and enfeebled health till shortly before his death, 10th June 1877.

His earliest important work is *Die Wahre Weihe des Zweiflers* ('The True Consecration of the Sceptic,' published in reply to De Wette's *Theodore* in 1823, and frequently republished and translated with titles such as *Sin and Redemption* and *Guido and Julius*); others are an Anthology of Eastern Mysticism (1825); commentaries, which have been some of them translated into English two or three times over, on Romans, John's Gospel, The Sermon on the Mount, Hebrews, and Psalms; a reply to Strauss; *Andachtsstunden* (Eng. trans. 'Hours of Christian Devotion,' 1875); some volumes of sermons; miscellaneous essays; and contributions to church history—*Lutherische Theologen Wittenbergs* (1852), *Das Akademische Leben des 17ten Jahrhunderts* (1852–54), and the first part of a *Geschichte des Rationalismus* (1865, never finished). A complete edition of his works (11 vols.) appeared at Gotha in 1863–72; and he edited Calvin's Institutes and some of his commentaries. See a sketch by Kähler (1877); and a fuller life by Witte (2 vols. 1884–86).

Thom, WILLIAM, author of *The Mitherless Bairn* and other poems in the Scottish vernacular, was born at Aberdeen in 1799, worked as a hand-loom weaver there, at Inverurie, and elsewhere, and, after a life of much poverty and distress, died at Hawkhill near Dundee, 28th February 1848. His collected poems were first published in 1845.

Thomar, a town of Portugal on the river Nabão (an affluent of the Zezere), contains in the ruined castle of the Templars and the convent palace of the order of Christ important examples of mediæval Portuguese architecture.

Thomas, ST, 'the doubting apostle' (see John, xix. 26–29), established the church in Parthia, according to the oldest tradition, and was buried in Edessa. A later tradition based on the apocryphal *Acta Thomae*, a Syriac document probably of Gnostic origin, carried him to India, where he died a martyr's death, his remains being subsequently removed to the West. The *Acta Thomae* was edited and translated by W. Wright (1871), a Greek version by Lipsius and Bonnet (Leipzig, 1891–1903). See APOCRYPHA.—For Thomas à Becket, see BECKET; for Thomas à Kempis, see KEMPIS; and for Thomas Aquinas, see AQUINAS.

Thomas, Anglo-Norman poet. See TRISTREM.

Thomas OF BAYEUX (d. 1100) was born in Bayeux, the son of a priest, and was a chaplain to William the Conqueror before being appointed in 1070 to the archbishopric of York. He refused at first to recognise Lanfranc's superiority as archbishop of Canterbury and only submitted under pressure. And even after a council of prelates at Windsor (1072) had decreed the superiority of Canterbury, Thomas stoutly upheld his rights. He had a reputation for learning and for church music, while he carried out numerous church reforms and rebuilt York minster, which had suffered badly in the Conquest.

Thomas OF CELANO. See DIES IRÆ.

Thomas OF ERCILDOUNE. See THOMAS THE RHYMER.

Thomas, CHRISTIANS OF ST., or Syrian Church of India, the oldest Christian Church in India, found mainly in the states of Cochin and Travancore on the Malabar coast. The church professes to have been planted by St Thomas, but is doubtless an offshoot of the Nestorian Church of Persia (in the patriarchate of Babylon), transplanted to India about the beginning of the 6th century. Founded by missionary effort, the Indian Church was probably recruited from Persia by the struggles of Christianity with revived Zoroastrianism and the triumph of Islam. Missionaries from Rome failed in the 14th century to persuade the Indian Christians to accept the authority of Rome; but the influence of Jesuit missionaries succeeded at the Synod of Diamper (Udiamperur, 12 miles SE. of Cochin) in 1599 in nominally bringing the sectaries into the Western Church. In 1653 all but a handful broke away; but the Carmelites soon regained much of what the Jesuits had lost, and the 'Romo-

Syrians' are now numerically the strongest section (423,968 in 1921). Under separate administration from 1878, the Catholics of the Syro-Malabar rite have since 1923 had an archbishop at Ernakulam. The independent church appealed to the Nestorian, Coptic, and Jacobite patriarchs. The last alone responded by sending a man. The Christians of St Thomas then threw off Nestorianism, and became monophysite Eutychians, with a metropolitan of their own, not recognising dependence on the patriarch of Antioch, but essentially Jacobite in theology and rites. Their sacred language is Syriac. The clergy are celibate. See GREEK CHURCH; G. M. Rae, *The Syrian Church in India* (1892); *John Rylands Library Bulletin*, January 1927.

Thomas, AMBROISE, French composer, was born at Metz, 5th August 1811. He entered the Paris Conservatoire in 1828, and in 1832 gained the Grand Prix for composition. He was a prolific composer, but his first success in opera was with *La Double Échelle* in 1837, followed by *Mina* (1843), *Betty* (1846), *Le Caïd* (1849), *Le Songe d'une Nuit* (1850), *Le Carnaval de Venise* (1853), *Mignon* (1866), *Hamlet* (1868), *Françoise de Rimini* (1882), with innumerable other works, characterised generally by a strong feeling for the dramatic and by good orchestration. Thomas was appointed a member of the Institute in 1851, professor of Composition in 1852, and succeeded Auber as director of the Conservatoire in 1871. He died 12th February 1896.

Thomas, ARTHUR GORING, born near Eastbourne, 20th November 1850, was educated for the civil service, but took up the study of music at the Paris Conservatoire (1875–77), and then for three years at the Royal Academy of Music, London, and wrote the operas *Esmeralda* (1883) and *Nadeshda* (1885), the cantata *Sun-worshippers* (1881), and many songs. He committed suicide 22d March 1892.

Thomas, GEORGE HENRY, an American general, was born in Virginia in 1816, graduated at West Point and entered the artillery in 1840, gained a brevet for gallantry against the Indians in Florida in 1841, and two others at Monterey and Buena Vista in 1846–47, and in 1855–60 served in Texas as a major of cavalry. In 1861 he was appointed brigadier-general of volunteers, and sent to Kentucky to turn backwoodsmen into soldiers; and with them in January 1862 he won the battle of Mill Springs. He was raised to major-general in April, and in October received the command of five divisions, forming the centre of Rosecrans' army, with which he saved the battle of Stone River (see MURFREESBOROUGH); and at Chickamauga (q.v.) again it was the centre that stood firm, and rendered the victory a barren one for the Confederates. In October 1863 Thomas was given the command of the Army of the Cumberland, and in November led it to the capture of Mission Ridge. In 1864 he commanded the centre in Sherman's advance on Atlanta, and then was sent to oppose Hood in Tennessee; and there in December, with troops that he had had to reorganise, he won the battle of Nashville, and destroyed the last considerable Confederate army in the south-west. For this he was appointed major-general in the United States army, and received the thanks of congress. He afterwards was in command of the military division of the Pacific, and died at San Francisco, 28th March 1870. Thomas was of a nature kindly, gentle, and singularly modest, of unswerving loyalty, and of sterling integrity; a soldier trained in nearly every arm of the service, he won and held without an effort the confidence of all who served under him. There is a Life by Van Horne (1882), and another by Copee ('Great Commanders' series).

Thomas, GEORGE JOHN, born at Tipperary, deserted in India from the navy in 1781, became general to the Begum Somru, and did feats of arms against the Sikhs and French. He died in 1802.

Thomas, JAMES HENRY, Labour politician, born 3d October 1875 at Newport, Monmouthshire, was a fireman and engine-driver in the service of the Great Western Railway, but came to devote himself to trade unionism and politics. He was an influential member of Swindon town council, and in 1910 entered parliament as member for Derby. The same year he was made president of the Amalgamated Society of Railway Servants, and in 1911 secretary of the National Union of Railwaymen. Since then he has laboured in the cause of railway unionism, and his name has been prominent in all the great industrial disputes concerning railwaymen, never allied to extremism. Made privy councillor in 1917, he was secretary of state for the colonies in the Labour government of 1924. His idea of Labour's policy is outlined in his *When Labour Rules* (1920).

Thomas, PHILIP EDWARD (1878–1917), writer (sometimes under the pseudonym 'Edward Eastaway'), was educated at St Paul's School and Lincoln College, Oxford, and was killed in the Great War. His work—simple and natural, but direct and impressive—includes verse, afterwards published as *Collected Poems* (1920); critical studies, *R. Jefferies* (1909), *Maeterlinck* (1911), *Duke of Marlborough* (1915), &c.; topographical descriptions, *The Icknield Way* (1913), &c.; a novel, *The Happy-go-lucky Morgans* (1913); *Celtic Stories* (1911), and other essays.

Thomas, SIDNEY GILCHRIST, metallurgist and inventor, was born 16th April 1850 at London. He had hopes of a medical career, but his father's death in 1867 obliged him to seek an immediate livelihood, and until 1879 he was a police-court clerk. Meanwhile he attended evening lectures on chemistry at the Birkbeck Institute, and was profoundly attracted by the problem of eliminating phosphorus from iron ore, using the Bessemer converter. He propounded a solution in 1875, and, with his cousin Percy Gilchrist, carried out experiments. The invention was patented in 1878, and a paper on the subject read at the Iron and Steel Institute in 1879. The industry at last came to interest itself in the discovery, which became of immense importance, especially on the Continent, where phosphoric ore predominates. Thomas gained a fortune, but lost his health, and died in Paris, 1st February 1885. See IRON AND STEEL, and his *Memoirs* edited by R. W. Burnie (1891).

Thomasites. See CHRISTADELPHIANS.

Thomasius, CHRISTIAN, a German philosopher and jurist, was born at Leipzig, 1st January 1655, studied at Frankfort-on-the-Oder (1675–79), and returning to his native town commenced to lecture on law in a style perfectly free from the pedantry of the schools. In 1687, to the astonishment of his Latin-speaking colleagues, he adopted the German language as the vehicle of his expositions, published his programme for the following year in the same tongue, and commenced an unconventional monthly journal. But this work and his advanced views on theological subjects excited so much opposition that he was forced to leave Leipzig, and went first to Berlin, and afterwards (1690) to Halle, where, under the patronage of the Brandenburg court, his lectures were the means of establishing a university since famous. In this university Thomasius became professor of Jurisprudence and rector, and here he died, 23d September 1728. It is to his credit

that he broke away completely from traditional pedantry and mediæval terminology, and introduced better methods into the scientific treatment of various departments of study; and he honourably signalised himself as a courageous opponent of trial for witchcraft and the use of torture. The characteristic features of his mode of thought are contained in his *Gedanken und Erinnerungen* (3 vols. Halle, 1723-26) and in his *Geschichte der Weisheit und Thorheit* (1693). His specialty was international law (*jus naturale*) and ethics. See works on him by Luden (1805), Dernburg (1865), Wagner (1872), Nicoladini (1887), and Landsberg (1894).

Thomas the Rhymer, a name given to the earliest poet of Scotland. The history of his life and writings is involved in much obscurity; but it is generally believed that Thomas Rymour of Ercildoune was the person whose poems and prophecies were extensively known among the people of Scotland at an early period. The Rhymer derived his territorial appellation from the village of Ercildoune (now Earlston), in the county of Berwick. The time of his birth is unknown; but he appears to have reached the height of his reputation in 1286, when he is said to have predicted the death of Alexander III. (q.v.), as recorded in Bower's continuation of the *Scotichronicon*. The Earl of Dunbar, having questioned the Rhymer as to what kind of weather was to be on the morrow, was answered that on that day before noon should be the greatest storm of wind that ever was heard in Scotland. Next day towards noon, the weather being calm, Dunbar expressed a doubt as to the truth of the prediction, when the Rhymer said: 'It is not noon yet;' and immediately thereafter a messenger arrived with the tidings of the king's accidental death at Kinghorn on the previous evening. From this and other prophecies the Rhymer became popularly known as 'True Thomas,' and was believed to have derived his skill from his intercourse with the Queen of Fairyland. The legend bears that he was carried off to Fairyland, and after three years' residence there was permitted to revisit the earth, but still remaining bound to return to his royal mistress when she should intimate her pleasure. Accordingly, one day, when a hart and hind were seen pacing the street of the village, the Rhymer instantly rose and followed them to the forest, never to return. (Compare the myth of TANNHÄUSER.)

The earliest historical document referring to Thomas Rymour of Ercildoune is a charter of Petrus de Haga of Bemersyde, to which the Rhymer's name is appended as a witness; its date is about 1260–70. Again, in a charter of 1294, Thomas of Ercildoune, describing himself as 'son and heir of Thomas Rymour of Ercildoune,' conveys his lands in the village of Ercildoune to the Trinity House of Soltra (Soutra). From this it has been inferred that the Rhymer was now dead; although Blind Harry, in his *Wallace*, speaks of him in 1296 or 1297 as then 'in to the faile'—the Cluniac priory of Fail in Ayrshire, by Sir J. Murray's conjecture. The Rhymer is also alluded to by Wyntoun in his *Chronicle*. Boece calls him Thomas Learmont, and the Russian poet Lermontoff claimed him for an ancestor; but there is no contemporary authority for this surname. Whether Rymour was a family surname or a personal appellation derived from his poetical reputation has also been discussed. The fact that his son, in the charter above referred to, applies the name to his father, but does not take it himself, seems to favour the latter view.

The Rhymer's prophecies were first collected and published in Edinburgh by Waldegrave in 1603. Sir Walter Scott (so also Mr M'Neill) believed him to be the author of the famous romance of *Sir Tristrem*, because his name occurs along with that of the romance in an ambiguous passage in the poems of Robert of Brunne (*c.* 1338). But the romance was founded on that of an earlier Thomas (see TRISTRAM), perhaps early confounded with the Rhymer. Another poem connected with his name is descriptive of his interviews with the Fairy Queen and his adventures in Fairyland; it displays poetical power of a very high order.

See *The Romances and Prophecies of Thomas of Ercildoune*, edited by Sir J. A. H. Murray (E.E.T.S., 1875); editions of *Thomas of Ercildoune* by Alois Brandl (Berlin, 1880); of *Sir Tristrem*, by Scott (1804), by Kölbing (Heilbronn, 1882), by G. P. M'Neill (S.T.S., 1886); Professor Child's *Popular Ballads* (1884); and a study by Burnham (1908).

Thomasville, capital of Thomas county, Georgia, 200 miles by rail WSW. of Savannah, with boys' and girls' colleges, foundries, &c. The surrounding district produces cotton, fruit, and grain in abundance. Pop. 8000.

Thomists. See AQUINAS.

Thompson, BENJAMIN. See RUMFORD.

Thompson, ELIZABETH, See BUTLER.

Thompson, FRANCIS, the son of a successful physician, who became a Roman Catholic, was born, not at Ashton-under-Lyne, but at Preston, 16th December 1859, and educated at Ushaw and (for medicine) at Owens College. He had no interest in the medical profession, but was obstinate in the ambition to be a poet; and spent years in Bohemian poverty in London, passing his nights perforce in the streets and his days in the Guildhall Library, selling matches at the street corners, and holding horses after the traditional example of Shakespeare. At last some of his verses found their way into a journal, and in 1893, by the help of the Meynells, he contrived to publish a volume of *Poems*, which obtained high praise from Coventry Patmore and Henry D. Traill. They showed an ingenious if somewhat bizarre imagination and faculty of versification, suggesting in some ways the enthusiastic flights of Crashaw or of Donne and the 'metaphysical' poets of the 17th century; and were followed by two other volumes of verse. He lived some time in a Capuchin monastery in Wales, and later at Storrington in Sussex; and died in London 13th November 1907, victim of starvation, persistent ill-heath, and frequent alcoholism. Ere his *Works* were published by Mr Wilfred Meynell in 1913 (3 vols.) it was generally recognised that Thompson had earned a place apart, and a high place, amongst English poets; and since it has been said that his 'Anthem of Earth,' 'The Hound of Heaven,' and 'New Year Chimes,' are as sure of immortality as anything written since Shelley sang, and 'as full of the incommensurable quality that marks the highest.' His prose, chiefly reviews and essays, is less important. See a (French) study of Thompson by K. Rooker (1913), Life by Everard Meynell (1913; new ed. 1926), and R. L. Mégroz, *Francis Thompson, the Poet of Earth in Heaven* (1927).

Thompson, WILLIAM HEPWORTH (1810–86), was born at York, studied at Trinity College, Cambridge, became regius professor of Greek in 1853, and in 1866 succeeded Whewell as Master of Trinity. A brilliant classical scholar and a profound student of Greek philosophy, he projected a great edition of Plato, but accomplished only the *Phædrus* and *Gorgias*, so that, though by his teaching he left an enduring mark on Cambridge scholarship, he is chiefly remembered by a few incomparable sarcasms.

Thoms, WILLIAM JOHN (1803-85), born in Westminster, was successively a clerk in Chelsea

Hospital, and clerk and deputy-librarian to the House of Lords. Secretary of the Camden Society, he was founder of *Notes and Queries* (1849), and its editor down to 1872.

He devised the word 'folk-lore' (1846) for the then new study, and his works include collections of *Early Prose Romances*, of *Lays and Legends*, and of *Anecdotes and Traditions*, besides a *Book of the Court* and a book on *Human Longevity*, a translation of Worsaae, and an edition of Stow's *London*.

Thomson, Sir Charles Wyville (1830–82), born at Bonsyde, Linlithgow, was educated at Edinburgh, and was professor at Cork and Belfast, ere in 1870 he came to the chair of Natural History in the university of Edinburgh. He was scientific head of the famous *Challenger* Expedition (q.v.), and was knighted in 1876. His books were *The Depths of the Sea* (1872) and *The Voyage of the Challenger* (1877).

Thomson, George (1757–1851), song-collector and friend of Burns, was born at Limekilns, Fife, and at Edinburgh rose to be principal clerk to the Board of Trustees. In 1792 he formed the idea of collecting every existing Scottish melody, and ultimately published six volumes of Scottish songs, followed by two of Irish songs, and three of Welsh melodies. Campbell, Scott, and Joanna Baillie contributed words to the melodies; but the most prolific writer was Burns, who contributed over 120 songs to the collection. For the musical department Thomson secured the services of Pleyel, Kozeluch, Haydn, Beethoven, Mozart, Weber, Hummel, Hogarth, and Bishop. See his Life and Correspondence by Cuthbert Hadden (1898).

Thomson, James (1700–48), poet, was one of the nine children of the parish minister of Ednam, Roxburghshire, where he was born 11th September 1700. He was educated first at Jedburgh, and then at the university of Edinburgh, where he studied for the church. From his earliest years he had written poetry, though he is said to have, with uncommon discretion, regularly burned his juvenile efforts. His father died in 1716, and in February 1725, a few weeks before the death of his mother, Thomson set sail from Leith to London. There his theological leanings seem to have receded before his taste for letters, and in 1726 he began with *Winter* the publication of his poem on the *Seasons*. The publisher advanced him only three guineas on it, but Lord Wilmington, to whom it was dedicated, fulfilled the expected duty of a patron by presenting him with twenty guineas. The piece was almost immediately successful, and Thomson's place as a poet was assured. *Summer* and *Spring* followed in the next two years. The second of these is inscribed to the Countess of Hertford, who invited the author to her country-seat 'to hear her verses and assist her studies.' Johnson records that 'he took more delight in carousing with Lord Hertford and his friends,' and that the lady was in consequence exceedingly indignant. In 1730 *Autumn* completed the *Seasons*. It was published with his collected works, which now included a *Poem on the Death of Sir Isaac Newton*, and *Britannia* (1727), a tirade against Spain's interference with English commerce, and a eulogy of Frederick, Prince of Wales, then in opposition to the court. In 1729 his tragedy of *Sophonisba* was produced. The audience was numerous and splendid, but 'nobody was much affected.' One luckless line, 'O Sophonisba, Sophonisba O,' is still remembered for the famous parody, 'O Jemmy Thomson, Jemmy Thomson O,' which, repeated by everybody, killed what little life there was in the piece. His other tragedies were *Agamemnon* (1738), *Edward and Eleonora* (1739), *Tancred and Sigismunda* (1745, in which Garrick and Mrs Cibber played the principal parts), and *Coriolanus* (produced after his death to pay his debts and aid his sisters). In 1731 Thomson was chosen to accompany Charles Talbot, son of Lord Chancellor Talbot, on the conventional continental tour, then a necessary part of the education of a young man of quality. The travellers visited France, Switzerland, and Italy, and something at least of the improvement in the poet's later work may be ascribed to the fresh impressions received on this delightful journey. On his return Lord Talbot gave him the sinecure office of Secretary of Briefs, but first the son and then the father died (1737), and a new favourite got the appointment. But Thomson was not long destitute, for he was now well-known in the literary sphere. The poem of *Liberty* (1735–36), inspired by his travels, was dedicated to the Prince of Wales, who was induced by Lyttleton to see Thomson. The result of the interview was a pension of £100 a year. He afterwards obtained the appointment of surveyor-general of the Leeward Islands. A deputy did what work there was to be done, and Thomson pocketed £300 a year. In 1740 the *Masque of Alfred* was produced at Cliefden before the Prince and Princess of Wales. It contains the song *Rule Britannia*, still, for want of a better, the popular patriotic ode. Thomson's last years were spent at Richmond, where English scenery is seen at its best. Here he finished his finest work, *The Castle of Indolence*. It was published May 1748. He died on 27th August following. As a man he was kindly, easy, gay, indolent, and of a rare modesty. No wonder he was universally popular. Stanza lxviii. Canto 1 ('written by a friend of the author'—Lord Lyttleton) of his last work pictures him as 'more fat than bard beseems,' as 'void of envy, guile, and lust of gain,' as all

> The world forsaking with a calm disdain,
> Here laughed he careless in his easy seat;
> Here quaff'd encircled with the joyous train,
> Oft moralising sage: his ditty sweet,
> He loathed much to write, nor cared to repeat.

Thomson's poems bear traces of minute and accurate observations of nature at first hand. His impressions were received early, for it is the rustic sights and sounds of the Border that are most prominent in his verse. He was not without a quaint if sometimes coarse humour. He has long passages of pleasing melody, though the exquisite note in his description of the Hebrides, 'placed far amid the melancholy main,' is but rarely heard. His thought is usually conventional.

See the editions by Logie Robertson (1891) and Tovey (2 vols. 1897), the Lives by Dr Johnson, Gilfillan, W. M. Rossetti, and G. C. Macaulay (1908); and Prof. Léon Morel, *James Thomson: Sa Vie et ses Œuvres* (1895).

Thomson, James, the poet of despair, was born a sailor's son at Port-Glasgow on the Clyde, 23d November 1834, and educated in an orphan asylum, where he was trained for service as an army schoolmaster; but through his friend Bradlaugh (q.v.) he became from 1860 onwards a contributor to the *National Reformer*, in which many of his sombre, powerful, and sonorous poems—including 'The City of Dreadful Night' (1874)—first appeared. In 1862 he became a lawyer's clerk; he went to the Rocky Mountains (1872) as a mining agent; was war-correspondent with the Carlists (1873); and from 1875 onward depended for livelihood largely on contributions to a monthly published by a tobacconist firm. Afflicted in body and profoundly gloomy in mind, he suffered sorely from the seductions both of narcotics and stimulants; and he died in University College Hospital, 3d June 1882. *The City of Dreadful Night and Other Poems* was published as a book in 1880,

praised by the critics and read by the public; and was followed by *Vane's Story, Essays and Phantasies, A Voice from the Nile* (1884, with memoir by Bertram Dobell), and *Shelley, a Poem* (1885). Thomson's pessimism was not academic, but the only too real and dark despair of a morbidly gloomy soul; his monotonously melancholy verses, not seldom tediously verbose, are occasionally varied by a burst of sarcasm or a brief dash of preternatural brightness. He wrote under the pseudonym 'Bysshe Vanolis' (often represented only by the initials B. V.), *Bysshe* being in honour of Shelley and *Vanolis* an anagram of Novalis.

See the Life by Salt (1889, revised 1914); the edition of the poems by B. Dobell (1895); and the *Biographical and Critical Studies* (1896).

Thomson, JAMES, engineer and physicist, elder brother of Lord Kelvin (q.v.).

Thomson, JOHN, minister of Duddingston and landscape-painter, was born 1st September 1778 at Dailly in Ayrshire, and, in spite of his wishes to be an artist, was trained to follow the profession of his father and grandfather. He completed his theological studies in Edinburgh, taking some lessons, however, from Nasmyth, the painter, and in 1800 became his father's successor at Dailly. Thence in 1805 he was transferred to the parish of Duddingston, near Edinburgh, where, along with the faithful performances of parochial duties, he found time to paint the large series of landscapes in virtue of which he ranks amongst the best, as he was the first, of Scottish landscapists. His style, though characteristic, reflects the influence of the Dutch, French, and Italian schools. He died 27th October 1840. See books by W. Baird (1895) and R. W. Napier (1919).

Thomson, JOHN ARTHUR, biologist, born 8th July 1861 in East Lothian, was educated at the universities of Edinburgh, Jena, and Berlin, and became professor of natural history at the university of Aberdeen in 1899. His writings, which are very extensive, include *The Study of Animal Life* (1892, revised ed. 1917), *Outlines of Zoology* (7th ed. 1920), *Progress of Science in the Nineteenth Century* (1904), *Heredity* (1908, 5th ed. 1926), *Darwinism and Human Life* (1910, revised ed. 1916), *Secrets of Animal Life* (1919), *The System of Animate Nature* (Gifford Lectures, 1920), *Science Old and New* (1925), *The Gospel of Evolution* (1925), *The New Natural History* (1925–26). He co-operated with Professor Patrick Geddes in *Evolution* (1911), *Sex* (1914), and *Biology* (1924), and has also written a great deal in journals and works of reference including this encyclopædia.

Thomson, JOSEPH, traveller, was born at Penpont in Dumfriesshire in 1858, studied at Edinburgh University, and commanded two expeditions to Africa for the Royal Geographical Society in 1878–79 and 1882, in the second of which he passed through the Masai country and visited Mount Kenya; he afterwards made journeys in the Niger country and in Morocco. He died 2d August 1895. Among his works are *To the Central African Lakes and Back* (1881), *Through Masai Land* (1885), *Travels in the Atlas* (1889), and a Life of Mungo Park (1891). See his Life by his brother (1896).

Thomson, SIR JOSEPH JOHN (knighted 1908), was born near Manchester in 1856, and educated at Owens College and Cambridge. From 1884 to 1918 he was Cavendish professor of Experimental Physics at Cambridge, and from 1905 to 1918 Professor of Physics at the Royal Institution, London. He was awarded the Nobel Physics Prize for 1906, was president of the Royal Society from 1916 to 1920. In 1918 he became Master of Trinity College, Cambridge. His researches on the ionic theory of electricity, radio-activity, and the electric theory of inertia of matter have been most important. In 1911 he announced a new method of chemical analysis of gases in vacuum tubes. The positive rays, deflected vertically by a magnetic and horizontally by an electric field, strike a photographic plate, on which they print a parabola for each kind of molecule present. Measurement of the parabola gives the atomic weight. His published works dealing with his researches are numerous. See the *History of the Cavendish Laboratory* (1910).

Thomson, WILLIAM (1819–90), born at Whitehaven, studied at Shrewsbury and Queen's College, Oxford. Bishop of Gloucester and Bristol for one year, he became in 1862 Archbishop of York. Besides sermons and papers, he published a long-famous *Outline of the Laws of Thought* (1848).

Thomson, WILLIAM. See KELVIN.

Thor, god of thunder, was the son of Odin and Earth. Thunder was caused by the rolling of his chariot. He was the strongest of gods and men; the gods called in his assistance when they were in straits. He was in particular a terror to the Giants (q.v.), with whom he was perpetually at strife, and whom he struck down with his hammer Mjolner, which had the property of returning to his hand after being hurled. The name of Thor was wide-spread; the English worshipped him as Thunar, the High Germans as Donar. As rude force is the predominating element in Thor, the humorous element of the Scandinavian belief attaches to him. Thus the giants often blinded him by magic, and made fun of him; yet he always shows his extraordinary strength in these cases, and in the long run his opponents are invariably overcome by the hammer. Thursday is so called from Thor; and the name survives in numerous names of places (Thunderfield in Surrey; Thundersley in Essex; Thurso), and also in personal names (Thorburn; in Scand. Thorbiörn, 'son of Thor'). See SCANDINAVIAN MYTHOLOGY.

Thoracic Duct. See LYMPHATICS.

Thorax. See CHEST.

Thorbecke, JAN RUDOLF (1798–1872), Dutch statesman, born at Zwolle (Overijssel), graduated after a distinguished career at Leyden, and eventually became professor of jurisprudence and political science at that university. Thorbecke, who headed the reform party after 1840, left his mark on the constitution of 1848, while his books (*Law and the State*, 1824; *Notes on the Constitution*, 1839) were of considerable importance. His *Historical Essays* appeared in 1860 and 1872.

Thoreau, HENRY DAVID, the 'poet-naturalist' and original writer in various departments, was born in Concord, Massachusetts, on the 12th July 1817, and died there on the 6th May 1862. Concord, a pretty rural village about 20 miles NW. of Boston, is noted as having been the home of Emerson, the Alcotts, Hawthorne, and Thoreau, the last, however, being the only one of the group born there. Thoreau's father, John Thoreau, was of French extraction. He was a merchant in Boston, and finally a lead-pencil maker in a small way in Concord, where he died in 1859. He is described as a small, deaf, and unobtrusive man, plainly clad, and minding his own business; very much in contrast with his wife, who was not small, nor unobtrusive, and who did not always succeed in confining her attention to her own business. Henry was the third of four children—John, Helen, Henry, and Sophia—all people of character and mark. 'To meet one of the Thoreaus,' says Sanborn, the biographer of Henry, 'was not the same as to encounter any other person who might cross your

path.' Helen and John were both teachers, and died comparatively young. Helen was evidently a fine nature. It was part of her earnings as teacher that helped to pay Henry's expenses at Harvard College, where he was graduated in 1837.

Henry did not distinguish himself in college. In his senior year he is said to have 'lost rank with his instructors by his indifference to the ordinary college motives for study.' After graduating he became a teacher, and was for a time employed in the academy at Concord where he had been a pupil. He seems to have begun his career as a lecturer when about twenty-one years of age, first appearing before the lyceum of his native village. He soon gave up teaching, and joined his father in making lead-pencils. But to this employment he did not stick. Having mastered the art, Emerson says, he had no further interest in it. He probably began his walks and studies of nature as the serious occupation of his life about this time—i.e. in 1838 or 1839. In August 1839 he made his voyage down the Concord and Merrimac rivers in company with his brother John. Out of this voyage came his first book, *A Week on the Concord and Merrimac Rivers*, published ten years later. The *Week* is a collection of essays on religious literature and philosophical themes, tied together by a slight thread of travel. Thoreau early made the acquaintance of Emerson, and in 1841–43 was a member of his household, having charge of the garden and doing other work for his friend. When Emerson made his visit to England in 1847, Thoreau again lived with the Emerson family. In 1845 Thoreau borrowed Mr Alcott's axe, and went and built himself a shanty in the woods by Walden Pond on land owned by Emerson. He went there, he said, for seclusion and solitude that he might the better study nature and become acquainted with himself. Here he seems to have written much of the *Week*, his essay on Carlyle, and many others of his papers. While here he demonstrated to himself that a man can support himself on less than $100 per year and have two-thirds of his time to himself. He spent nearly two years at Walden. He says: 'I left the woods for as good a reason as I went there.' Out of his experience has come his most popular book, *Walden, or Life in the Woods* (1854), one of the freshest and most stimulating books in American literature.

After the Walden episode he supported himself in various ways, such as a job here and there at whitewashing, gardening, fence-building, and land-surveying. He also had a call to lecture now and then, and he wrote for the current magazines. He made three trips to the Maine woods in 1846, 1853, and in 1857, where he saw and studied the moose and Indians. His papers which were the outcome of these trips were published in book form after his death (1864), and next to *Walden* form his most valuable and interesting volume. In 1850 he made a trip to Canada with his friend Ellery Channing, out of which trip came his posthumous volume, *A Yankee in Canada* (1866). Thoreau began to keep a daily journal of his walks and observations in 1835. These journals swelled to thirty volumes before he died, and are a complete record of what he saw and what he thought. They seem to have been written and revised with great care, and are rich in fine thoughts, graphic descriptions, and fresh natural history notes. Thoreau died of consumption, sitting up in bed on a morning in early May, and as gently as if going to sleep. After his death there were published from his lectures and magazine articles *Excursions in Field and Forest*, with a biographical sketch by Emerson (1863), and *Cape Cod* (1865). In 1865 a volume appeared of *Letters to Various Persons*, which also included nine of his poems. Editions of his works appeared in 1893 (11 vols.) and 1906 (20 vols., including the Journal). See the Lives by Page (1877) and Salt (1890, 1896); Channing, *Thoreau, the Poet Naturalist* (1873); Bazalgette, *Henry Thoreau* (trans. 1925); several studies by F. B. Sanborn (1882, 1901, 1917), and his edition of the *Letters* (1894); also F. H. Allen's *Bibliography* (1908).

Thorium (Th; atom. number, 90; atom. weight, 232), a metal resembling aluminium, but taking fire below a red heat, and burning with brilliancy, is the commonest, and in some respects the most interesting, of the radio-active substances, and is largely used in the manufacture of incandescent gas-mantles. Thorium was discovered in 1828 by Berzelius in thorite; it is now obtainable in practically unlimited quantities from monazite sand, found in many places, but especially in Brazil, Canada, Travancore, South Africa, and North Carolina. Its radio-activity was fully demonstrated by Ramsay and Hahn in 1903. See LEAD, p. 564, and RADIUM.

Thorkelin, GRÍMUR JÓNSSON (1752–1829) was a notable Icelandic antiquary, who wrote on Icelandic literature, history, and law.

Thorn, an Old English and Icelandic letter (Þ) taken from the Runic alphabet. See T and Y; and for Eth (ð), see D. See also RUNES.

Thorn. See THORNS, HAWTHORN, SLOE, BUCKTHORN, CACTACEÆ, ROBINIA.

Thorn (Pol. *Toruń*), capital of the Polish voivodeship of Pomorze, till 1919 in the Prussian province of West Prussia, stands on the right bank of the Vistula (here spanned by a viaduct 1100 yards long). Founded by the Teutonic order in 1231, and a member of the Hanseatic League, Thorn became a Polish town in 1454, and was annexed to Prussia in 1815. It was five times besieged between 1629 and 1813; and in 1878 was made a fortress of the first rank by Prussia, the old fortifications being removed, and a series of detached forts built. Copernicus was a native. An active trade in corn and timber is carried on. Pop. (1921) 39,424.—The CONFERENCE OF THORN, an unsuccessful effort to explain away the differences between Catholics and Protestants, with a view to reunion, met in 1645.

Thornaby-on-Tees. See STOCKTON.

Thorn-apple (*Datura*), a genus of plants of the family Solanaceæ, having a tubular five-cleft calyx, a large funnel-shaped five-lobed corolla, a two-laminated stigma, and an imperfectly four-celled, prickly, or unarmed capsule. The species of the genus are annual herbaceous plants, rarely shrubs or trees; they are in general narcotic, and productive of wild excitement or delirium. The common Thorn-apple, or Stramonium (*D. Stramonium*), is an annual plant, with smooth stem and leaves, white flowers, and erect prickly capsules, a native of the East Indies, but now often met with in Europe, as also in Asia, the north of Africa, and North America. It contains a peculiar alkaloid, *Daturine*, which is practically identical in its action with Atropine (q.v.). The leaves and seeds are employed in medicine (see ASTHMA). The dried leaves have a faintly narcotic smell, and an unpleasant bitter taste; the seeds, which are of a black colour, are still more poisonous. A variety with pale violet flowers and purplish violet stem is frequently cultivated in gardens as an ornamental plant. Still more narcotic is the Soft-haired Thorn-apple (*D. Metel*), a native of the south of Asia and of Africa. The Thugs (q.v.) of India employed it in order to stupefy their victims, or, in other cases, to poison them outright. From its

seeds, along with opium, hemp, and certain spices, a strong intoxicating substance is prepared, which the Mohammedans of India use in order to produce in themselves an indescribable joyfulness and extremely pleasurable feeling for a short time;

Common Thorn-apple (*Datura Stramonium*):
a, ripe fruit.

but the use of it destroys the constitution. *D. sanguinea*, the red thorn-apple of Peru, is used by the Indians to prepare a very powerful narcotic drink called *tonga*, which stupifies when very diluted, and when strong brings on maniacal excitement. The beautiful *D. fastuosa* has flowers externally of a violet colour, and white within, and is cultivated as an ornamental plant, especially a variety with what are called double flowers, which consist rather of two corollas, one within the other. *D. arborea*, a native of Peru and Colombia, has come to be also very generally cultivated in flower-gardens in Europe. It has very splendid pendulous white flowers, 9 to 12 inches long, which diffuse a sweet smell in the evening and at night. Like those of *D. sanguinea* they are much visited by humming-birds.

Thornback (*Raia clavata*), a species of ray or skate, common on most parts of the British coast. It attains a large size; the snout or fronto-nasal

Thornback (*Raia clavata*).

process is short, and the form is nearly rhombic. The upper surface is brown, with lighter spots, the under surface white. The upper surface is rough with minute sharp scales, and has numerous nail-like crooked spines, each with an oval bony base. A few strong spines may also occur on the ventral surface, especially in the female. In the male the teeth are pointed, in the female flat. The thornback is used as food, particularly in autumn and winter, but is most abundantly captured in spring and summer, when it comes to shore-waters to deposit its eggs, each enclosed in a mermaid's purse.

Thornbury, George Walter, was born in London, a solicitor's son, in 1828, and, after studying art for a while, at seventeen began writing for the *Bristol Journal*. He soon settled in London, and published between twenty and thirty novels, books of travel, and other works, among them the fiery *Songs of the Cavaliers and Roundheads* (1857), *As the Crow Flies* (1859), *Life of Turner* (1861), *Historical and Legendary Ballads* (1775), and vols. i. and ii. of *Old and New London* (completed by E. Walford, 1872–78). He died 11th June 1876.

Thornhill, in the West Riding of Yorkshire, since 1910 part of Dewsbury, has an old church.

Thornhill, Sir James (1676–1734), historical painter and sergeant-painter to Queen Anne, decorated the dome of St Paul's, executed paintings for Blenheim, parts of Hampton Court, and Greenwich Hospital. Of his easel-pictures the best known is the view of the House of Commons in 1730; and he executed a few portraits, some etchings, and good copies of Raphael's cartoons. He founded a successful drawing-school, his most famous pupil being Hogarth, who became his son-in-law. Knighted by George I. in 1715, he sat in parliament as member for his native borough of Melcombe Regis.

Thorns, or Spines, may be metamorphosed leaves or parts of leaves, as is shown by their position on plants; for lateral buds occur in their axils. In the Barberry the compound spines are entire metamorphosed leaves; in *Robinia Pseudacacia* the spines are metamorphosed stipules, parts of the leaf-sheaths; in many species of Caragana and Astragalus they are pointed persistent petioles (leaf-stalks). The thorns of the Blackthorn and Hawthorn are pointed branches; in the Furze (whin) they are both pointed leaves and branches. Adventitious roots form thorns in the palm genus Acanthorhiza. Some would appropriate the word prickles to pointed projections of the epidermis, to be compared with hairs and surface-glands. (See Hairs of Plants.) Spines and prickles tend to disappear from plants under cultivation —i.e. from plants that are growing luxuriantly; and conversely, they tend to increase in plants growing in unfavourable conditions. These and other facts have led to the theory that spines in general are an expression of the 'ebbing vitality of a species,' and not, as is usually thought, the result of a process of natural selection which has caused them to be evolved as protections against mammals. But this theory was severely criticised by Wallace, in his *Darwinism*, who argued that spinous plants are vigorous and have an extensive range; and, further, that they are very rare or entirely absent from those districts, oceanic islands for instance, where there are few or no mammals, which is what the theory of their selection as protective organs would lead one to expect; and genera which have many spinous species in other countries have no such representatives in oceanic islands. But see Holly.

Thornycroft, Sir William Hamo, R.A., sculptor, was born in London, 9th March 1850, and studied at the Royal Academy schools. 'Artemis' (1880) was his first success; then followed 'Teucer' (1881), 'The Mower' (1884), and the portrait statues of General Gordon in London (1885), John Bright at Rochdale (1892), and Cromwell at Westminster. Other works of his were the Colet Memorial at St Paul's school, the Queen Victoria

Memorial at the Royal Exchange, the Gladstone Memorial in the Strand, the Lord Curzon Memorial at Calcutta, and the King Edward Memorial at Karachi. Elected R.A. in 1888, and knighted in 1917, he died 18th December 1925.

Thorough. See STRAFFORD.

Thorough Bass means either what has, as *figured* bass, been explained at ACCOMPANIMENT —a bass voice-part written at length, with numerals written below (or above) it to indicate the chords of the harmony; or, more loosely, the science of harmonic composition. See HARMONY, COUNTERPOINT.

Thorpe, BENJAMIN (born 1782; died at Chiswick, 19th July 1870), edited numerous Old English texts, and was the author of *Northern Mythology* (3 vols. 1852).

Thorvaldsen (often in English Thorwaldsen), BERTEL, sculptor, was born at sea on the 19th November 1770. His father, an Icelander, was on his way to Copenhagen, where he settled as a carver of figure-heads for ships; and the son was brought up to the same profession. From his eleventh year the boy attended art classes, and in 1793 he gained the first gold medal for design at the Academy of Copenhagen, and along with it the privilege of three years' residence abroad for the purpose of study. Accordingly, in 1796 he sailed for Rome, whose collections kindled in him the undying ambition to revive the glories of sculpture as practised by the ancient Greeks. From Canova he had early and generous recognition; and shortly, by the model for a 'Jason,' he secured reputation. No purchaser could, however, be found for it till, in 1803, just as in hopeless disgust the artist was about to return to Copenhagen, he received from 'Anastasius' Hope a commission for its production in marble. From this time forward prosperity and fame flowed upon him in full tide. In 1819 he returned to Denmark, where his reception was triumphal. He remained at home but a year, and then returning to Rome continued to prosecute his art assiduously up to 1838, when he again departed, to pass his remaining years in his own land. Its climate, however, proved no longer suitable to him, and the year 1841 found him once more at Rome. In 1844, having revisited Copenhagen to complete some of his works there, he died suddenly in the theatre, of disease of the heart, on the 24th March. All the works remaining in his possession he bequeathed to his country, to be preserved in a museum bearing his name, for the maintenance of which he also left the bulk of his fortune, reserving a sufficient provision for his natural daughter; and this collection is now one of the chief glories of Copenhagen. Thorvaldsen's strength lay in classical and mythological subjects. His efforts in Christian subjects, even the famous 'Christ and the Twelve Apostles' at Copenhagen, are obviously a less spontaneous outcome of his genius. Of his many works those best known by photography and otherwise are the reliefs 'Night' and 'Morning.' Of his many portrait busts and statues those of Byron, now at Cambridge, and Œhlenschläger are perhaps the most notable. His reputation has considerably fallen off.

See the Life by Thiele (3 vols. Leip. 1852–56; Eng. abridgement by Barnard, 1865); and books by Hammerich (Gotha, 1876); Eugène Plon (Eng. trans. by Mrs Cashel Hoey, 1874); Sigurd Müller (Copenhagen, 1890 *et seq.*); Rosenberg (1896); and Trier (1903).

Thoth, the Egyptian Hermes or Mercury, the mythical inventor of the arts and sciences, music and astronomy, and especially of speech and hieroglyphs or letters, over which he was supposed to preside. He is usually represented by the figure of an ibis, or by a man with the head of an ibis. The dog-headed baboon was sacred to him. See EGYPT, Vol. IV., p. 236.

Thou (Lat. *Thuanus*), JACQUES-AUGUSTE DE, the most famous historian of his time, was born at Paris in 1553. His father and grandfather had both been presidents of the parliament of Paris, so that he inherited connections which smoothed his own way to fame and place. After five years spent at the university of Paris he continued his studies at Orleans, and subsequently at Valence under the famous jurist Cujacius. At Valence, also, he formed a friendship, equally honourable to both, with the younger Scaliger. Returning to Paris, he witnessed the massacre of St Bartholomew (1572), of which, though a good Catholic, he afterwards spoke with the severest reprobation. A journey to Italy extended his knowledge and turned his mind still more decidedly to the writing of his great history, the plan of which he had already conceived. He had originally chosen the church as his profession, and actually became one of the canons of Notre Dame in Paris; but at the instance of his friends, though against his own wish, he eventually followed the law. His own merit and his family interest brought him rapid promotion; and at the age of thirty-five he obtained the reversion of the office of president of the parliament of Paris. During the wars of the League De Thou stood fast by Henry III., though he was fully aware of his shortcomings as a king, and took a prominent part in the intricate diplomacy of the time. He stood equally high in the opinion of Henry IV., under whom he acted as keeper of the Royal Library, a post which brought him into contact with the great scholars of the time, the elder Casaubon among others. In affairs of state his most distinguished services were rendered in connection with the Edict of Nantes (1598–99), for which his personal character and the esteem in which he was held by Huguenot and Catholic alike eminently fitted him. He died at Paris in 1617.

The great work of De Thou's life was his stupendous history of his own time (1543–1607), written in Latin, filling four closely-printed folios. A complete edition of 138 books was issued by two of his friends three years after his death. The appearance in 1604 of the first eighteen books brought its author a European reputation, and those that followed had equal success. His impartial treatment of heretics, however, did not find favour at Rome; and much to the chagrin of De Thou, who was at heart a pious son of the church, his history was placed on the index of prohibited books. During the 17th and 18th centuries De Thou was ranked with the greatest historians, and he was universally quoted as a master of political wisdom. In England Dr Johnson had serious thoughts of translating him; Pitt paid him a special tribute in the House of Commons; and the best edition of his history was published in London by Samuel Buckley at the expense of Dr Meade, and partly under the superintendence of the historian Carte. His commentaries on his own life and a quantity of Latin verses were De Thou's other contributions to literature.

The following are the chief editions of De Thou's History—11 vols. 8vo, Paris, 1609–14; 4 vols. fol., Frankfort, 1628; French translation, 10 vols. 8vo, Paris, 1740; edition by Samuel Buckley (7 vols. Lond. 1733). For an account of De Thou's life, see Collinson, *Life of Thuanus* (London, 1807; chiefly based on De Thou's own Memoirs); Philarète Chasles, *Discours sur la Vie et les Ouvrages de J.-A. de Thou* (Paris, 1824); Harrisse, *Le Président de Thou et ses Descendants* (1905).

Thouars, a town of France, in the department of Deux-Sèvres, 24 miles by rail south of Saumur.

The town, situated on the river Thouet, has several mediæval churches, an imposing stronghold (17th century) now used as a prison, and remains of the old ramparts. There is a trade in wine and agricultural produce, and sabots and furniture are made. Pop. 8000.

Thought-reading, or MIND-READING, a term which came up in 1881 to designate the act or art of discerning what is passing in another's mind by some direct and unexplained method, depending neither on gesture, facial expression, nor any articulate or other voluntary indication. One explanation offered is that the mind emits waves of thought-force, vibratile nervous energy or the like, which can be received and understood by another mind suitably attuned. Mind and memory reading on the part of so-called fortune-tellers is said to result from the exceptional capacity of the reader for attuning his mind (by a process of self-hypnotism) to that of his subject. The unbelieving theory is that A inevitably, but quite unconsciously, communicates a succession of slight but sufficient muscular indications to B. For telepathy see APPARITIONS. See the *Proceedings of the Psychical Research Society.*

Thourout, a town in the Belgian province of West Flanders, 11 miles SW. of Bruges. Of great commercial importance in the middle ages, it now manufactures linens and hats, and has horse fairs. Pop. 11,000.

Thousand Buddhas, CAVE OF THE. See TUN-HUAN.

Thousand Islands. See ST LAWRENCE.

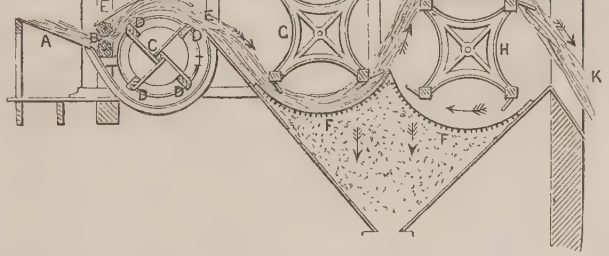
Thousand Nights and a Night. See ARABIAN NIGHTS' ENTERTAINMENTS.

Thrace, a name used by the ancients somewhat vaguely for a large region to the west of the Euxine (Black Sea) so as to include the whole country between the Ister (Danube) and the Ægean, and even part of the Scythian country beyond the Ister. Under the Romans, however, part of this vast region was joined to Macedonia; the country between the Ister and the Hæmus (Balkans) became the province of Mœsia (mod. Bulgaria); so that the province of Thracia was the remaining district between the Hæmus and the Propontis, and from the Nestus River (mod. Mesta) to the Euxine; see the map of the Roman empire at ROME. Thracia was hilly in surface, Rhodope (q.v.) being the chief mountain-system; the chief river was the Hebrus (Maritza); great part of the area was occupied by forest. Who the ancient Thracians were has been much disputed; their language has perished utterly; but there seems no doubt that they were a branch of the Indo-European stock, and kinsmen, more or less remote, of the Greeks, though they were regarded by the Greeks as barbarians. Thrace never constituted one powerful monarchy, though at times the king of one or other of the Thracian clans extended his power over great part of the country, so as to be formidable to the Athenian colonists or to the Macedonian monarchs. Under Roman suzerainty Thrace long remained half independent; but under Vespasian it became a province of the empire, and its people became Romanised so entirely that it seems not improbable the Thracian provincials were the direct ancestors of the Vlachs, speaking Rumanian, who are still numerous south of the Danube. Goths and Huns overran the country; Bulgarians occupied the north; and after the conquest of Constantinople by the Turks the fortunes of Thrace were largely bound up with those of that city. After the treaty of Berlin (1878) the northern part of Thrace became the province of Eastern Rumelia, autonomous at first but later under Bulgaria; the rest remained an integral part of the Ottoman empire until the Balkan wars (1912–13) deprived Turkey of all Thrace east of the Maritza and extended the Bulgarian frontier to the Ægean. Further shuffling of territories took place after the Great War, and the treaty of Lausanne (1923) left Greece in possession of Thrace as far as the Maritza, Bulgaria having been deprived of its coastal strip by the treaty of Neuilly (1919).

Thrale. See PIOZZI.

Thrashing is the separating of the grain or seeds of plants from the straw. The earliest method was doubtless the beating out of the grain from the ears with a stick. An improvement on this was the practice of the ancient Egyptians and Israelites of spreading out the loosened sheaves of grain on a circular piece of hard ground 50 to 100 feet in diameter, and driving oxen backwards and forwards over it, so as to tread the grain out; but, as this damaged part of the grain, it was partially superseded by the thrashing-sledge, a heavy frame mounted on three rollers, which was dragged over the heaps of sheaves. Similar methods of thrashing were employed by the Greeks and Romans—the stick, the treading by men or horses, and the thrashing-sledge being found in common use among them. The primitive implement in northern Europe was the stick, and an improved modification of it, the *flail* (two sticks loosely fastened together at one end by stout thongs, has not yet disappeared.

Various attempts were made to supersede the flail by a machine, but with little success, till 1787, when Andrew Meikle, an ingenious Scottish mechanic, produced a thrashing-mill so perfect that even after having run the gauntlet of a century and a half of improvers it is essentially the machine of its original inventor. In Meikle's mill the sheaves are loosened and spread out one by one on the feeding-board, A (see fig.), with the ears towards the machine; they are then pushed forward till caught between two revolving fluted rollers of cast-iron, B; and as soon as one sheaf disappears between the rollers another is presented to them. Behind the rollers is



a rapidly revolving *drum* or cylinder, C, having four *beaters*, D, D, D, D, or spars of wood armed with iron placed along its surface parallel to its axle; and these beaters, striking the heads as they are protruded from between the rollers, detach the seeds and husks. Grain and straw then pass together over the cylinder, the former falling through the wire-work, F, F, while the straw is carried forward by the circular rakes, G, H, and, being by them thoroughly tossed and separated from the grain and chaff, is ejected at K. The grain which has fallen through the wire-work is received into a winnowing-machine, where it is cleansed from chaff, &c., and then is either discharged upon the

barn-floor or, as is the case with the most improved machines, is raised by a series of buckets fixed on an endless web, and again winnowed, to separate the perfect grains from the light and small seeds. Barley is, previous to the second winnowing, subjected to the process of 'hummelling,' by which the awns are removed; but the rest of the process is the same as above.

The earlier alterations upon Meikle's invention were chiefly confined to modifications of the drum; such as diminishing the distance between the drum and its cover, E, E, increasing the number of the beaters, and accelerating the speed of the drum. The speed of the thrashing-machine was next increased, while appliances were attached by means of which at the one operation the grain was thrashed, dressed ready for market, elevated to the granary, and perhaps even sacked, the straw being carried on endless webs or by a series of rakes travelling in a trough-shaped channel to any given part of the straw barn. Blowers for similarly disposing of the chaff, and arrangements for carrying the sheaves forward to the drum and at the same time cutting the bands, are among the latest improvements.

The portable thrashing-machine, now so generally employed in America and England, and to a lesser extent in Scotland, has not the two grooved rollers, the loosened sheaf being at once submitted to the action of the thrashing machinery; the drum, which is a *high-speed drum*, is provided with six or eight beaters, and its cover or concave is capable of being set at any required distance from it by means of screws.

The attention of inventors and manufacturers of thrashing-machines has been turned not only to securing increased speed and more finished work, but also to providing against the risk of accidents to those employed about the mills. The feeding of those high-speed drums which were getting so common was attended with considerable danger, and to prevent this safety-drums of different patterns have been introduced by the various makers. The best of these are so effective that accidents in feeding now rarely occur. Some of the modern machines thrash from 12 to 16 or even more quarters of oats per hour. From 6 to 8 quarters per hour are common quantities even for comparatively small machines.

The driving-power is wind, water, horse-power, steam, or oil; but the first is so very uncertain and unequal in its operation that it has nowadays been mostly superseded by the others. Water-power is always desirable, and when it can be had in sufficient quantity or regularly it is much to be preferred in point of economy, its mode of application to thrashing being either by the ordinary Water-power (q.v.) or by Barker's Mill (q.v.). Horse-power was the agent in most common use in the earlier days of thrashing-mills, the horses being yoked to beams attached to a vertical revolving shaft which communicated motion by means of bevelled gear to the thrashing-machine. But it was found that this kind of work was very trying for the horses, and interfered considerably with the other work of the farm; and accordingly steam-power, as being more economical, extensively superseded horse-labour, engines of 6 to 10 horse-power being generally employed. Latterly oil engines, which are more suitable for intermittent work, and which require less labour and supervision, have largely replaced steam. They are usually of from 15 to 25 horse-power. Portable thrashing mills and engines are thought by many to be more economical, from their saving the labour of transporting the crop from the stack to the barn, and from their adaptability to the requirements of a farmer who may rent more than one holding in a district. On the other hand, however, some prefer the fixed machine on account of cheapness and diminished liability to derangement. Hand-power thrashing machines are made for use on small holdings. They are hard to drive, but do their work admirably.

Thrasimene. See TRASIMENE.

Thrasybu'lus, Athenian general and statesman, fought in many campaigns at home and abroad, and was a strenuous supporter of the democracy. In 411 B.C. he helped to overthrow the oligarchy of the Four Hundred, and was banished by the Thirty Tyrants, but restored the democracy in 403. He conquered Lesbos, and defended Rhodes, but was slain in 389.

Thread-cells, another name for Stinging-cells (q.v.), given on account of the coiled thread or lasso that springs out and stings.

Thread-manufacture. Any fibrous substance, such as cotton or flax, when it is to be woven, is first spun into yarn, which is sometimes called thread. Sewing-thread, however, always consists of at least two or more yarns twisted together. In the spinning of yarn the process is the same whether it is to be woven into cloth or twisted into thread (see SPINNING). Beginning with the spun yarn, the stages in the process of manufacturing a six-cord cotton thread (a very common kind) are: (1) The yarn is doubled and wound upon bobbins; (2) the double yarn is then twisted into a two-ply thread; (3) the thread is next rewound on bobbins for the second twist; (4) the thread is twisted a second time on the twisting-frame, three two-ply threads being thus formed into a six-cord thread; (5) the thread is rewound on large bobbins, from which it is reeled into hanks for bleaching or dyeing; (6) the bleached or dyed thread is next rewound on bobbins for spooling; (7) spooling—i.e. winding the thread on small bobbins called spools, reels, or pirns, for use in sewing by hand or machine. Sometimes thread is wound into hanks or balls for crochet, embroidery, or knitting work. The spindles of the spooling-machine run at a speed of 7000 revolutions per minute. See also BOBBINS.

Cotton thread is made at Manchester and in its neighbourhood, as well as at Glasgow. Paisley is, however, the principal seat of the manufacture in Great Britain. The making of thread on an industrial scale was begun in that town in 1722 by Christian Shaw of Bargarran. She had obtained information from Holland about the process of making linen thread, and what she and her friends manufactured was sold at the time under the name of 'Balgarran thread.' The industry did not become of great importance so long as flax was the material used. But in the early part of the 19th century, when the spinning-machines of Hargreaves, Arkwright, and others came largely into use, the manufacture of cotton thread was begun in Paisley, and its progress has been on the whole rapid. This has been especially the case since 1860 through the constantly increasing use of sewing-machines for both domestic and factory purposes. From 10,000 to 12,000 workers are employed at the Paisley thread-mills. In 1896 J. & P. Coats, Limited, employing fully 5000 persons, absorbed the other four leading British thread firms into one great firm, the capital of which is now £20,250,000. The English Sewing Cotton Company, with a capital of £3,000,000, in addition to their English connection, owns all the ordinary stock of the American Thread Company.

Linen thread is made at Johnstone near Paisley, Belfast, Nottingham, and other places. Although a much less quantity of it is manufactured, it is perhaps used for a greater variety of purposes than

cotton thread. Fine kinds are required for lace-making, and strong kinds for sewing heavy fabrics, as well as for shoemakers', saddlers', and book-binders' use. Silk thread, the stronger kinds of which are called twist, is now used to a very large extent for sewing dyed articles of dress.

Threadneedle Street, in the City of London, got its name from the Merchant Taylors' Company, whose present hall is built on an estate acquired by them as early as 1331. It leads from Bishopsgate Street to the Bank of England, which hence is often called the 'Old Lady in Threadneedle Street.'

Thread-worms, a popular name for Nematoda, a class of more or less thread-like worms, many of which are parasitic, while others are free-living. The body is unsegmented; there is a well-developed cuticle; there is a complete alimentary canal surrounded anteriorly by a nerve-ring from which six nerves run forward and backward. The sexes are separate, and the life-history is often intricate. Several species are often parasitic in man—*Ascaris lumbricoides*, in the small intestine; *Oxyuris vermicularis*, in the cæcum and large intestine; *Dochmius duodenalis*, in the small intestine; *Filaria sanguinis hominis*, in the blood; *Dracunculus medinensis*, the Guinea-worm; *Trichinella spiralis; Trichocephalus dispar*, in the cæcum and large intestine. Not a few are parasitic on plants—e.g. several species of Tylenchus, which infest wheat and other crops. Some occur in domesticated animals—e.g. *Strongylus armatus*, the palisade worm, which causes aneurysm in the horse, or *Filaria immitis*, in the heart of the dog, or Ollulanus, which passes from mouse to cat. Others live freely in water and putrefying substances—e.g. Enoplus and many other genera. Long delicate threads often found in garden soil are species of Mermis and its relatives, which spend their larval life as parasites in insects.

See Ascaris, Guinea-worm, Parasitic Animals, Trichina; Leuckart, *Parasites of Man* (trans. 1886); Schneider, *Die Nematoden* (1876); Hamann, *Die Nemathelminthen* (1895); Yorke and Maplestone, *Nematode Parasites of Vertebrates* (London, 1926).

Threats, considered legally, are intimidation by moral terrorism. Their purpose is to make the person threatened surrender some right, or pay money, or do something to his detriment from fear of a greater evil. The usual form of the crime is sending anonymously or otherwise a threatening letter demanding money or valuable property, under the menace that the victim will be murdered, or his house or property will be destroyed, or his cattle killed or wounded, or that he will be charged with some infamous crime. (The offence is committed though a guilty person be threatened.) To procure the execution of a deed by threats, or to threaten to publish a libel, are varieties of the same offence. In their extreme form such acts are punished with penal servitude for life.

Three Kings, Feast of the, a famous mediæval festival, identical with Epiphany or Twelfth Night. For the kings, see Magi.

Three Rivers (*Trois Rivières*), capital of St Maurice county, Quebec, at the confluence of the St Maurice and St Lawrence, 95 miles by rail NE. of Montreal. It is the centre of a lumbering district, and has a large export trade in lumber, grain, cattle, &c.; and it manufactures textile-wares, paper and pulp, iron goods, boots and shoes. Three Rivers was founded by Champlain in 1634; a severe battle fought here on 16th June 1776 proved disastrous to the Americans. The city is the seat of a Roman Catholic bishop. Pop. 22,000. —Three Rivers, Michigan, on the St Joseph River, 128 miles by rail E. of Chicago, has valuable mineral springs; pop. 5200.

Threshing. See Thrashing.—For Thresher, see Fox-shark.

Thrift. See Annuity, Domestic Economy, Friendly Societies, Insurance, Savings Banks.

Thrift (*Armeria*), a genus of plants of the family Plumbaginaceæ, having the flowers collected into a rounded head, a funnel-shaped, dry, and membranous calyx, five petals united at the base, and narrow, often grass-like, leaves. Two species are included in the British flora, one of them (*A. plantaginea*) only because it is found in Jersey. It is an Atlantic plant, common on the coasts of Spain and France, with some isolated stations elsewhere (Val d'Aosta; Evolène, Valais; near Mainz). The other (*A. maritima*) grows in turf-like tufts, with linear leaves, scapes a few inches high, and beautiful rose-coloured, purple, or white flowers, an ornament of the sea-coasts of Britain and of Europe generally, and also frequently found (in a broader-leaved variety, called *planifolia*) on high mountains. Under the names of thrift and sea-pink it is often planted in gardens as an edging, for which it is very suitable, being of a fresh green all the year, and exhibiting its fine flowers in profusion in July and August; but it requires to be renewed every two or three years, the smallest rootless sets growing, however, with great readiness in the moist weather of spring. The flowers are an active diuretic.

Common Thrift (*Armeria vulgaris*).

Thring, Edward, a great educationist, was born at Alford Rectory in Somersetshire, November 29, 1821, and had his education at Eton and King's College, Cambridge, of which he was elected fellow. He took orders, and served in curacies at Gloucester and elsewhere, but in September 1853 found the work of his life in the appointment to be head-master of Uppingham school. He found it insignificant, but made it one of the healthiest and best equipped among the public schools of England, giving himself for thirty-four years with restless energy to the task of educating his pupils in the highest sense of the word, and imprinting upon their characters a high ideal of duty as the great end of life. The manly fibre of his own nature, his earnestness and honesty, his firm discipline, and his stern denunciation of cowardice and wrong gave a distinctive character to the school. He died 22d October 1887. His works include volumes of school songs and lyrics, an English grammar, a Latin gradual and a construing book; *Thoughts on Life Science*, anonymously (1869), *The Theory and Practice of Teaching* (1883); Uppingham *Sermons* (2 vols. 1886), *Addresses* (1887), *Poems and Translations* (1887), and *Uppingham School Songs and Borth Lyrics* (1887)—Borth was the Cardiganshire village to which the school removed on the outbreak of scarlet fever in 1874.

See J. H. Skrine, *A Memory of Edward Thring* (1889); H. D. Rawnsley, *Edward Thring* (1889); the Biography by Principal Parkin appeared in 1898.

Thrips. See Corn Insects.

Throat, Affections of the. The term throat is applied somewhat loosely to the back of the mouth and front of the neck; its diseases may therefore be taken to include those of the Larynx (q.v.) and upper part of the trachea, of the upper part of the œsophagus, and of the thyroid gland (see Goitre). Sore throat, however, as commonly used, refers to inflamed and painful conditions of the tonsils and neighbouring parts (see under Palate), which are numerous. One of the most important (Quinsy, q.v.) has already been discussed; and those attending diphtheria, measles, scarlet fever, syphilis, and other infectious and contagious diseases are sufficiently referred to under their several headings. Sore throat may also be a result of the gouty or rheumatic diathesis, or of the action of certain drugs (especially belladonna and iodide of potassium). See also Thrush, Mumps, &c. A few other conditions remain to be considered here.

The disease known as *granular pharyngitis*, or popularly as *Clergyman's Sore Throat*, is brought on by such causes as obstruction in the nose causing breathing through the mouth, habitual dietetic indiscretion with dyspepsia, too much smoking, and particularly by over-use of the voice for speaking in dusty or badly ventilated places, or when the method of voice-production is faulty. Women are more liable to this affection than men, and persons who are neurotic, anæmic, or debilitated are more troubled than the robust. The condition shows itself by huskiness of the voice with a tendency to coughing, clearing of the throat, and expectoration when the voice is used, and a sense of irritation in the throat. When the back of the throat is examined, the mucous membrane shows dilated veins, and is swollen and covered with small rounded or oval prominences of reddish colour. These are of a structure similar to the adenoids found in children. The treatment consists in rest for a time from public speaking, cultivation of a proper mode of voice-production, attention to the condition of the nose, the use of tonics, change of climate, &c. Locally to the throat, in the early stages, various astringent applications, and later cauterisation of the granules by chromic acid, nitrate of silver, or the galvano-cautery effect a cure.

Simple or *catarrhal sore throat* is usually a slight affection, most common in young persons, and often resulting from cold. The throat is reddened, but little swollen. A day or two in the house is usually sufficient to effect its disappearance; the sucking of astringent lozenges (e.g. tannin or red gum) or chlorate of potash pellets, is also useful. In its chronic form it is more troublesome, but will generally yield to continued use of astringent lozenges, or the application, twice a day with a brush, of glycerine of tannic acid, or a paint composed of iodine 5 grains, iodide of potassium 10 grains, oil of peppermint 2 minims, and glycerine 1 ounce.

Ulcerated sore throat is generally the result of unhealthy conditions acting on persons in a weakly state. It is particularly common in nurses and students occupied in hospital work, and is generally speedily recovered from when the patient is placed in healthy surroundings and put upon tonic treatment. The white spots seen on the tonsils in *lacunar tonsillitis*, a more common and slighter affection, are often mistaken for ulcers, but they really consist of excessive and thickened secretion from the recesses of the tonsil. These should be squeezed out, and one of the astringent paints mentioned above should be applied.

Cutting the throat is comparatively seldom the result of accident; it is more often due to a murderous attack, and most frequently to an attempt at suicide. The first duty of the surgeon in treating a case of cut throat is to arrest the flow of blood. Ligatures should be applied to wounded arteries, and steady pressure with the finger (beneath which a small pad of lint is placed) to wounded veins, such as the external jugular. When the bleeding has completely ceased, means may be taken for bringing together the edges of the wound. If the main arteries or veins are cut the wound is rapidly fatal. When the air-passages are wounded there is great risk of the occurrence of bronchitis or pneumonia, and the patient must be kept in a warm room, and care taken to prevent either food or discharges from the wound from passing down the windpipe.

Throgmorton, an English family which produced several important members in the 15th and 16th centuries. Sir John (d. 1445) was clerk of the treasury, and later chamberlain of the exchequer and under-treasurer of England. His descendant, Sir Nicholas (1515–71), father-in-law of Sir Walter Raleigh, distinguished himself at the battle of Pinkie; was tried (1554) for suspected complicity in Wyatt's rebellion but acquitted; was Queen Elizabeth's ambassador in France, where he was imprisoned as having sided with the Huguenots; and was repeatedly ambassador to Scotland in the troublous period 1561–67. In 1569 he was sent to the Tower for a time as being concerned in the scheme for marrying Mary, Queen of Scots, to the Duke of Norfolk. His brother Sir John (d. 1580) was also involved in the proceedings following Wyatt's rebellion, but was finally released and made chief justice of Chester. His son Francis, the conspirator, was born in 1554, and plotted on the Continent and in London to restore the pope's authority, and to aid Mary, Queen of Scots, in her claim to the English throne. He was arrested in 1583 while writing to Mary, and, after much trial and torture, was executed the following year at Tyburn.

Thrombosis (Gr. *thrombos*, 'a clot of blood'), an affection of the blood-vessels (either veins or arteries), which essentially consists in a coagulation of blood (forming a true clot) at a certain fixed spot. Under certain morbid conditions the blood has a tendency to coagulate in its vessels during life on the least provocation. Thus, slight pressure on the side of a vein will sometimes induce this coagulation, while in other cases it is due to inflammation of the tissues which surround a vein, or laceration of a vein (as when the placenta is expelled from the uterus). A clot thus formed in a vessel may increase and extend from one to another, till it reaches and finally fills a large vessel.

Throndhjem. See Trondhjem.

Thrush (*Turdus*), a genus of Passerine birds of the family Turdidæ. The bill is of moderate size and slightly convex; the gape is furnished with hairs; the nostrils lie at the base of the bill, partly covered by a membrane; the first wing-feather is very short; and the outer and middle toes are connected at the base. The genus includes numerous species widely distributed throughout temperate and even cold regions. The largest known British species is the Missel Thrush (*T. viscivorus*), sometimes called the 'storm-cock' from its habit of singing before or during wind or rain. It breeds freely throughout the British Islands, but migrates from the colder regions on the approach of winter. It breeds early in the year; its nest is usually in the fork of a tree, and neatly lined with grasses and moss. The adult male measures about 11 inches; the prevailing colour of the upper parts is grayish brown, under parts brownish white, with dark spots.

The Song Thrush or Mavis (*T. musicus*) also occurs in almost all parts of Britain. It resembles the missel thrush in general appearance, but is smaller in size, of a more olive-brown

colour, and possesses finer powers of song. The nest of the song thrush is usually composed of roots and grasses, lined with a thin coating of mud, decayed wood, or dung. The eggs are of a greenish-blue colour, with black or brown markings, and in the warmer parts of the country two broods are reared in a season. The food of the

Missel Thrush (*Turdus viscivorus*).

song thrush consists of berries, insects, worms, and small molluscs, the shells of the last being broken by repeated knocking against a stone. Other species either resident in Britain or visiting it for a part of the year are the Blackbird (*T.*

Song Thrush (*Turdus musicus*).

merula), the Fieldfare (*T. pilaris*), the Redwing (*T. iliacus*), and the Ring-ouzel (*T. torquatus*), all of which are described in separate articles. The genus Turdus is represented in North America by the Wood Thrush (*T. mustelinus*) and several other species. The flesh of all the thrushes is esteemed a delicacy, and they are snared in enormous numbers while they are assembling for their winter migration.

Thrush, known also as *Infantile Sore Mouth*, is commonly a disease of early infancy, although it may occur at any age. Its characteristic symptom is the presence of small roundish white specks or patches (Aphthæ, q.v.) on the lining membrane of the cavity of the mouth and throat, on the surface of the tongue, the angles of the lips, &c. In thrush crops of these little patches commonly succeed one another. They render the mouth hot and tender, in consequence of which the act of sucking is accompanied by difficulty and pain. In association with these local symptoms are indications of general constitutional disturbance, such as feverishness, drowsiness, sickness, flatulence, colicky pains, diarrhœa, &c. The complaint sometimes seems to be the result of improper diet, or of imperfect attention to cleanliness of the bottle, &c., if the child is being brought up by hand, or of unwholesome milk; of bad ventilation, &c.; in any case the direct cause of the patches is the growth of a fungus, the *Oidium albicans*. The disorder usually lasts eight or ten days, and is only attended with danger when the local affection runs into a low form of gangrenous ulceration. As a local application to the patches, glycerine or honey of borax may be applied with a camel-hair pencil; or a pinch of a mixture of powdered borax and loaf-sugar (1 to 8 or 10) may be placed occasionally on the tongue, and the infant allowed to spread it over the mouth. An occasional dose of gray powder may be required; and in some cases a little brandy, or small doses of quinine and iron.

Thrush, or FRUSH, in the horse, consists in inflammation of the sensitive surfaces within the frog, giving rise to a fetid discharge from the cleft, and sometimes causing lameness. Want of cleanliness is the chief cause. Daily, when the horse returns to his stable, the foot should be washed out with soap and water, carefully dried, and the fissures filled with mineral tar. If amendment does not speedily ensue, a dressing of calomel should be substituted for the tar several times a week. Ragged or loose portions of the frog should be removed by the knife or scissors.

Thuanus. See THOU (JACQUES-AUGUSTE DE).

Thucydides, the great historian of the Peloponnesian war, born in the deme Halimus most probably about 460 B.C., was the son of Olorus, and was perhaps related to Miltiades and Cimon. It is probable that his literary model was Antiphon, and that he was influenced in his views on philosophy by Anaxagoras. Athenian as he was, of good family, and resident in the most cultivated community in Greece, he must have known Sophocles, Euripides, Aristophanes, Phidias, Protagoras, Gorgias, and possibly Herodotus and Æschylus. He was further possessed, either by inheritance or by acquisition through marriage, of gold-mines in that part of Thrace lying opposite the island of Thasos. We know from himself that he was one of the sufferers from the terrible plague of Athens, and also one of the few who recovered. He held military command, and he had under him an Athenian squadron of seven ships at Thasos, 424 B.C., when he failed to relieve Amphipolis, which fell into the hands of Brasidas. Condemned to death as a traitor, he took refuge in exile and retired to his Thracian estates. His exile enabled him, as he tells us, to associate with the Peloponnesians quite as much as with the Athenians; and he probably spent some time also in Sicily, as we may infer from his minute descriptions of Syracuse and its neighbourhood. According to his own account, he lived in exile twenty years, and probably returned to Athens after the destruction of its walls, in 404. He is said to have spent his last years in Thrace, and to have died there—some say by violence—his remains being brought to Athens. The date is unknown: conjecture places it at 399 B.C.; at all events he did not live long enough to revise book viii. or to bring his history down to the end of the war.

If Herodotus was 'the father of history,' Thucydides was the first of critical historians, and no better account of his methods can be given than is contained in his own words: 'Of the events of the war I have not ventured to speak from any chance information, nor according to any notion of my own; I have described nothing but what I either saw myself or learned from others, of whom I made the most careful and particular inquiry. The task was a laborious one, because eye-witnesses of the same occurrences gave different accounts of them, as they remembered or were interested in the actions of one side or the other' (i. 22). There is hardly a

literary production of which posterity has entertained a more uniformly favourable estimate than the history of Thucydides. This high distinction he owes to his undeviating fidelity and impartiality as a narrator; to the masterly concentration of his work, in which he is content to give in a few simple yet vivid expressions the facts which it must have often taken him weeks or even months to collect, sift, and decide upon; to the sagacity of his political and moral observations, in which he shows the keenest insight into the springs of human action and the mental nature of man; and to the unrivalled descriptive power exemplified in his account of the plague of Athens, and of the Athenian expedition to Sicily. Often, indeed, does the modern student of Greek history share the wish of Grote, that the great writer had been a little more communicative on collateral topics, and that some of his sentences had been expanded into paragraphs, and some of his paragraphs into chapters. But this want cannot have been felt by the contemporaries of Thucydides, while the fate of other ancient historians warns us that had his work, like theirs, been looser in texture, or less severely perfect, it would not have survived, as it has done, the wearing influence of time, or remained the *ktēma es aei*—the 'possession for ever'—it has proved to the world.

It was reserved for the nineteenth century to impeach the credibility, depreciate the matter, and to condemn the style of Thucydides. As these indictments, however, usually conclude with the statement that Thucydides remains nevertheless the greatest of historians, they show that Thucydides' fame is proof against the solvents of modern criticism, and they help us to a more complete understanding of the qualities which have given to Thucydides' work such a wonderful hold over the intellects and imaginations of all his readers and all his critics. As an Athenian comedian remarks, we do not believe a man because he takes an oath—we trust the oath because we believe in the man. And so we believe in Thucydides not because we have external tests to apply (for we have not enough), but because the universal experience of all who read him is a feeling of conviction that his intention was to speak the truth, as far as he could ascertain it. This conviction is ultimately due to the fact that in the man's work we are brought directly into touch with the man, and we judge his character as we judge that of any acquaintance whom we know in the flesh. No man can devote himself for twenty-seven years to composing a work without putting a good deal of himself into the work, or without writing his character down in it—unconsciously but none the less legibly. What then are the qualities of character which impress the reader of Thucydides? First, his constant endeavour to ascertain facts, and to put down as facts nothing but facts. For one thing, he did not choose a period of ancient history, which, being ancient, must be based on vague hearsay or dim tradition. He preferred contemporary history and events which he himself witnessed in part, while he could obtain the evidence of eye-witnesses for the remainder. Nor did he wait until the conclusion of the war before setting about his task; from the very beginning he began collecting his facts. And, except in one or two places which are easily discernible, his love of facts has bred in him a remarkable impartiality. Next, his history is not designed to prove or illustrate any theory. He himself, in the passage quoted above, disclaims all attempt to adapt facts 'to any notion of his own;' and it is evident that beginning to write, as he began, at the commencement of the war, when its course and its issue were yet in the future, he could not have designed to bring its history into conformity with any pre-conceived or *a priori* theory. Herodotus, writing the history of the past, was in a position to trace the finger of destiny in what had happened, and to explain history by means of final causes. But Thucydides, when he undertook to record the present, thereby deliberately elected to confine himself to efficient causes. This preference for efficient causes and for 'scientific' history, in the best sense of the term, is intimately connected with the 'positive' nature of his history—that is to say, with his perpetual endeavour to record facts and to distinguish them from inferences drawn from facts. A clear consciousness of this difference is involved in one of the most characteristic features of his history—that is, the marked difference between his narrative and the speeches which he introduced into it. The former contains facts and facts only, facts stated with precision and objectivity—e.g. his description of the symptoms of fever in sufferers from the great plague. The speeches, on the other hand, are not what the speakers actually said—but of this Thucydides warns the reader at the beginning, showing clearly at once the distinction he drew between facts and inference, and his anxiety that the reader should realise the distinction.

As for the subject of Thucydides' history, if the Peloponnesian war was not a matter of importance in universal history, it was at least not Thucydides' fault that he was not contemporary with some more important war. But we may beg leave to doubt whether the Peloponnesian war was of inferior interest for the fortunes of mankind. Had it not been for the exhaustion it induced, Greece would not have succumbed to the Macedonian, and consequently Alexander's conquests would never have spread Greek culture over the ancient world. But, apart from this, Thucydides' history is the history of the effects of empire on an imperial state; and, as such, will always be of enthralling interest to citizens of sovereign communities. Finally, Thucydides' style, criticised by Dionysius and condemned by Mure, is in the speeches difficult beyond all possibility of dispute. To throw the blame of this obscurity on the unformed condition of Attic Greek at the time when Thucydides wrote is warrantable indeed, but is no adequate defence. To point, on the other hand, to the tract *On the Athenian Polity* as proof that Attic prose could be translucent in Thucydides' time is beside the point, for Attic, as is well known, could only be written well by those who lived continuously in Athens, and Thucydides was exiled for many a year. But, in truth, the question whether it is Thucydides or the literary age in which he lived that is to be blamed for his obscurity is a wholly irrelevant question. Obscurity, whatever be its cause, is a crime in a writer. But it is a crime which carries its own punishment, for it diminishes the number of an author's readers. The exact amount of criminality is not to be determined on any abstract principles or by the exercise of any mysterious 'taste:' it admits of one simple practical test—viz. has the obscurity of his style (in so far as it exists), as a matter of fact, prevented him from attaining fame? In the case of Thucydides it has had no such effect; and that Thucydides has, in spite of his difficulty, always been read is in itself sufficient testimony that there is no other historian to rank with him.

In *Thucydides Mythistoricus* (1907), F. M. Cornford argues that Thucydides reconstructed history on Æschylean principles. See also Wilamowitz-Moellendorff, 'Die Thukydideslegende,' *Hermes* xii. 1878); G. B. Grundy's *Thucydides and the History of his Age* (1911); W. R. M. Lamb, *Clio Enthroned* (1914); J. A. K. Thomson, *The Greek Tradition* (1915); J. B. Bury, *Ancient Greek Historians* (1919); G. F. Abbott, *Thucydides*,

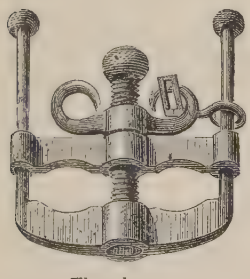
A Study in Historical Reality (1926); R. W. Macan in vol. v. of the *Cambr. Anc. Hist.* (1927). The best editions are: in Latin that of Poppo (11 vols. 1821–40), in German that of Classen (8 vols. 1870–78), in English that of H. S. Jones (1900–1)—with Arnold's (1830–35) for historical illustration. The best English translation is by Professor Jowett (with commentary, 2 vols. 1881; 2d ed. 1900); that by the Rev. Thomas Dale is also good (2 vols. 1848), as is that of the speeches by H. M. Wilkins (2d ed. 1873). Foster Smith gives text and translation ('Loeb Library,' 4 vols. 1919–23).

Thugs (ultimately from the Sanskrit *sthaga*, 'concealer,' 'deceiver'), the name for a religious fraternity in India, which, in honour of the goddess Kâlî, the wife of Siva, who is held to take special delight in human sacrifice, and to whom, despite penal laws, victims have even in recent years been offered, was addicted to the committal of murders, and lived upon the plunder obtained from its victims. Banding together in gangs, they assumed the appearance of ordinary traders, and, insinuating themselves into the confidence of unsuspecting fellow-travellers, killed them by strangling (whence they were often called *phansigars*, 'stranglers'), or by poisoning with datura (see THORN-APPLE). They were bound together by bloody oaths, and carried on systematic assassination on a large scale. They considered their murders pious rites, and their profession highly honourable. The confraternity appears to have come into existence before 1000 A.D.; it flourished under the early Mohammedan rulers of India; and, though the English government frequently apprehended Thugs, it was reserved for Lord William Bentinck, assisted by Captain Sleeman, to adopt such vigorous measures as practically extirpated thuggee (*thagî*). In 1826–35 no fewer than 1562 Thugs were apprehended—mainly by help of accomplices turning informers—of whom 382 were hanged, and most of the rest transported or imprisoned for life. Thuggee by poisoning was still carried on long after strangling was a thing of the past.

See Col. Meadows-Taylor's graphic tale, *Confessions of a Thug* (1839; new ed. 1879); Capt. Sleeman's *Report* (1840); Hutton's *Thugs and Dacoits* (1857); for thuggee in 1867, Hervey's *Some Records of Crime* (1892); and for their jargon, Sleeman's *Ramaseeana* (1836) and Yule and Burnell's *Hobson-Jobson* (1903).

Thuja. See ARBOR VITÆ.

Thule, the name generally given by the ancients to the most northerly part of Europe known to them, of which their want of knowledge was eked out by the imagination. According to Pliny it was an island in the northern ocean, discovered by the navigator Pytheas of Massilia, who reached it after six days' sail from the Orcades. Possibly Pytheas followed closely the eastern coast of Great Britain, and only heard reports of the groups of islands farther north—the Orkneys and Shetlands, perhaps Iceland. Nansen (*In Northern Mists*, 1911) insists that the Thule of Pytheas was Norway.



Thumbscrew.
(In Ant. Mus., Edinburgh.)

Thumb, TOM. See DWARF, PERRAULT.

Thumbscrew, or THUMBIKINS, an instrument of torture for compressing the thumb, largely made use of by the Inquisition in Spain, and also occasionally used in England when examination by torture was practised there. It was much in use during the brutal persecutions of the Covenanters in Scotland, and the famous Carstares (q.v.) was tortured thus for an hour and a half at Holyrood to obtain the secrets of the Argyll party.

Thun, a picturesque and ancient town of Switzerland, 19 miles SSE. of Bern by rail. It is an important military post. It stands on the Aar, hardly a mile from the Lake of Thun (12 miles long, 2 broad; greatest depth, 1844 feet), out of which the river rushes past the town in a stream of crystal clearness. A 12th-century castle and a venerable church are the chief buildings. Pop. 6000.

Thunder. See LIGHTNING, STORMS. Stone axes (see STONE AGE) are sometimes called thunderbolts, from a notion that they are meteoric stones; and for a like reason Belemnites (q.v.) are called thunder stones. For thunder gods, see THOR, JUPITER, ZEUS. For the Thundering Legion, see AURELIUS.

Thurgau (Fr. *Thurgovie*), a frontier canton in the north-east of Switzerland. Area, 381 sq. m.; pop. (1920) 135,933, of whom two-thirds are Protestants. The surface, unlike that of the other cantons of the country, is undulating or hilly, but nowhere mountainous, the chief height being the Hörnli in the extreme south, 3727 feet. The principal river is the Thur, which, flowing WNW. through a broad fertile valley, joins the Rhine in the canton of Zurich. Agriculture, especially vine-growing, is the chief occupation, and there is some cotton-spinning. Capital, Frauenfeld (pop. 8711).

Thurifer (Lat. *thus*, 'incense,' and *fero*, 'I carry'), the attendant in the Roman Catholic Church, at solemn mass, vespers, &c., whose duty it is to carry the *thurible*, or incense-vessel, and either to minister incense himself or to present the thurible to the officiating priest. The office is one of those which belong to the so-called 'minor order' of *Acolyte*.

Thurii, a city of Magna Græcia, on the Gulf of Tarentum, near the site of Sybaris (q.v.). It was founded in 443 B.C. by colonists sent from Greece by Pericles (among them Herodotus and the orator Lysias), who came to the aid of the exiles from Sybaris, but ultimately expelled them. The city attained to considerable power, and did not acknowledge Athens as its founder owing to the mixed character of its population. It was plundered by Hannibal (204 B.C.); and a Roman colony founded in 194 B.C., probably on the same site, has only insignificant ruins.

Thuringia (Ger. *Thüringen*), one of the republics of Germany, comprising the former Saxon Duchies (except Coburg), the two principalities of Reuss, and the two of Schwarzburg. Before 1920 the name Thuringia was vaguely used to denote generally that part of the ancient Saxon area bounded by the Werra, the Saale, the Harz Mountains, and the Thuringian Forest. The republic of Thuringia is scarcely so extensive, its northern border lying considerably south of the Harz Mountains; an 'exclave,' however, lies near the Harz. Except in the east the land is hilly, the chief features being the Thuringian Forest and the valleys of the Werra and of the Elbe tributaries—the Saale, Unstrut, Ilm, and Elster. Thuringia got its name from the Thuringian tribe of Germans, who were found inhabiting it in the 5th century. A duchy of Thuringia was founded in 634, but was abolished by Charles Martel; in 804 Charlemagne made it a margraviate, but in 908 the country was subjected to Saxony for a time. Later it appears governed by a succession of landgraves, and at the division of the lands of the Wettin family in 1485 Thuringia fell to the Ernestine (or elder) branch (see SAXON DUCHIES: SAXONY). After the German revolution of 1918 the several states became

republics. The two divisions of Reuss united in 1919, and soon all the other states were considering a policy of unification. Coburg, however, joined in with Bavaria. The union was recognised by the Reich, 20th April 1920, and the first Diet met on 11th March 1921, and adopted a constitution. There is a single chamber elected by proportional representation; a check on its action is provided by the devices of popular initiative and referendum. The state council has a president, but there is no provision for a president of the republic.

The country is largely agricultural, about half its area being arable; forests cover one-third. Wheat, rye, oats, and potatoes are the chief crops, and fruit and vegetables are grown. Cattle, sheep, and horses are bred, and there is a good deal of mining and industrial activity, the salt mines and manufactures of potassium and glass being important. Bricks, porcelain, textiles, chemicals, toys, &c. are also manufactured.—The area of the republic is 4541 sq. m., and its population (1925) 1,628,398. The capital is Weimar (41,000); other towns of importance are Gera (75,000), Jena (54,000), Gotha (48,500), Eisenach (41,000), Altenburg (41,000).

Thuringian Forest (*Thüringerwald*), a chain of wooded hills running NW. and SE. through Thuringia, and occupying a great part of the western portion of the state. It belongs to the Sudetic system, and has a length of some 70 miles, its breadth varying from 6 to 22. The scenery, especially in the NW., where a few of the summits attain a height of 3000 feet, is very picturesque.

Thurles, a market town in county Tipperary, Ireland, situated on the river Suir, 87 miles SW. of Dublin by rail. Four miles distant is the beautiful 14th-century ruin of Holy Cross Abbey. Thurles has a (classical) Roman Catholic cathedral, the seat of the archbishopric of Cashel. Pop. 4800.

Thurlow, EDWARD, BARON, was born a clergyman's son in 1731, at Bracon-Ash in Norfolk. He was sent to Canterbury grammar-school, whence he passed to Caius College, Cambridge. Here he was as insolent and insubordinate as at school, and was sent down in 1751 without a degree. He at once entered at the Inner Temple, and was called to the bar in 1754. He was a fellow-pupil in a solicitor's office with the poet Cowper, and still affected idleness, although in reality he worked hard to make himself a good lawyer. His lofty stature, strongly marked features, dark eyes, bushy eyebrows, and look of self-possession led every one with whom he came in contact to attribute to him qualifications he really did not possess—'no man,' said Fox, 'ever was so wise as Thurlow looked.' An accidental meeting at a coffee-house with the Scottish solicitors in the great Douglas case led to his employment in it as junior counsel, and to his acquaintance with the members of the Douglas family. One of them, the Duchess of Queensberry, by her influence with Lord Bute obtained for him in 1761 the rank of King's Counsel. Soon after this he acquired a still higher reputation by his speech in the Douglas Peerage case—the greatest effort of his life. In 1768 he was returned for Tamworth, and became a zealous supporter of Lord North; in March 1770 he was made Solicitor-general, and the year after Attorney-general. He gained the special favour of George III. by the violent zeal he displayed in supporting his American policy. In 1778 he became Lord Chancellor and Baron Thurlow, and such was his influence with the king that he was allowed contrary to all precedent to retain the office under the Rockingham administration. He caused great embarrassment by opposing all the measures brought in by that government. Under the coalition ministry of Fox and North he was compelled to retire, but continued a vigorous opposition, and was restored as Chancellor on Pitt's accession to power. For a time he supported the government; but, relying again on the support of the king, he once more began, first secretly, then openly, to undermine the power of his colleagues. Pitt then intimated that he or Thurlow must retire, and the king, without any hesitation, consented to his removal (1792). Thurlow at once sank into obscurity. He amused himself in reading the Latin and Greek classics with his nephews, and spent much of his time in visiting and receiving visits. He died at Brighton, September 12, 1806. Thurlow was vulgar and arrogant, his profanity and immoralities notorious. Lord Campbell says he can find nothing recorded of him to justify the great reputation for ability he had among his contemporaries, and ascribes it chiefly to his assuming manner; but it should be remembered that he had no Boswell to record his talk, and that it was this that was most admired. It was of no ordinary man that Johnson said, 'I would prepare myself for no man in England but Lord Thurlow. When I am to meet him, I should wish to know a day before.'

Thurn and Taxis, PRINCES OF, a princely house with high rank, hereditary dignities, and possessions in Central Europe, the two chief seats of the family being Ratisbon and Laucin in Bohemia. Descended from the Della Torre of Milan (whence the first part of their name), with a castle of Tasso or De Tassis (whence the second), members of this house have been distinguished in connection with posts. One established posts in Tirol in 1460; another, ennobled in 1512, established the first post between Vienna and Brussels in 1516. His descendant became in 1595 grand-master of the posts of the Holy Roman empire, and secured the right of carrying on the posts of the empire which extended from Hamburg to Rome, and from Paris to Vienna, a right which became a hereditary privilege. In 1681 the principality of Thurn and Taxis in the Netherlands was conferred on the head of the house; and in 1698 the princely rank and title were made hereditary, and passed to all members of the house. The postal privileges were gradually limited by the governments of the various countries; but it was not till 1867 that Prussia secured by treaty with the family the abolition of the monopoly in the territories annexed in 1866.

Thurot, FRANÇOIS, was born at Nuits in Côte d'Or, son of a petty innkeeper, 22d July 1726. He grew up a reckless and violent lad, and served on a privateer, but was captured and kept a year in Dover prison. He managed to seize a small boat, and crossed the Channel with a pair of sculls and his shirt as a sail. The Maréchal de Belle-Isle hearing of the exploit enabled him to study navigation, and Thurot, again joining a privateer, rose so rapidly that by 1748 he was able to fit out a merchant-ship. He next spent a few years in England, mostly in London, betwixt music, mathematics, and dissipation, varied by smuggling and perhaps piracy; and in 1753 his ship was seized by the English. The outbreak of war recalled him to France. He was given the command of a squadron of two frigates and two sloops, with which he scoured the Channel, cruised along the east coast of England and Scotland, frightening terribly the townspeople of Banff (5th October 1757), and fought a brisk action with two English frigates at the mouth of the Forth. In October 1759 he again weighed from Dunkirk with a squadron consisting of four frigates, with 1200 soldiers under command of Flobert, and made his way to Lough Foyle, intending a descent on

Londonderry. High gales made it impossible to enter, whereupon he crossed to Islay for supplies, and then sailed for Belfast Lough, intending to make a dash on Belfast. Flobert ruined the plan by insisting on attacking and taking Carrickfergus first (21st February 1760), but refused to move on Belfast. The delay had given time for three English frigates of Hawke's fleet to come up; and Thurot fought till he was struck down. See Laughton's *Studies in Naval History* (1887).

Thursday Island, one of the smallest of the group of the Torres Straits islands, north of Cape York, and belonging to Queensland. It has an excellent harbour, and is a telegraph station with important wireless installation, a port of call for all mail steamers traversing the Straits, and the centre of pearl and trepang fisheries.

Thurso, a police burgh and seaport of Caithness, at the mouth of the Thurso River, by rail (1874) 21 miles NW. of Wick and 154 NNE. of Inverness, with six churches and a town-hall (1870). The harbour at the mouth of the river had got silted up; but extensive improvements were carried out in 1891–92, when also a good pier at Scrabster was extended, on the west side of the bay, where steamers regularly call. Scrabster was the chief port of departure to Scapa Flow, in the Orkney archipelago, when the British fleet was stationed there during the Great War; and from there Lord Kitchener embarked to join H.M.S. *Hampshire* on her ill-fated voyage. The rock scenery around the town is very fine. Paving-stones are prepared and exported, and live-stock and grain shipped. Sir John Sinclair was born here in 1754, and the self-taught geologist, Robert Dick (1811–66), was a baker here from 1830. Pop. 3000.

Thyatira. See AK-HISSAR.

Thylacine (*Thylacinus*), the largest of the extant predaceous marsupials, represented by one species (*T. cynocephalus*), now restricted to Tasmania, and in process of extermination at the hands of the sheep-farmers, whose folds it is wont to ravage. It is somewhat smaller than a wolf, has a dog-like muzzle, a long tapering tail, and is grayish brown in colour, with black cross bands on the hind part of the back and loins. It is very active and fierce, and is popularly called a 'tiger,' a 'wolf,' or a 'hyæna.'

Thyme (*Thymus*), a genus of humble, half-shrubby plants, of the family Labiatæ, having a two-lipped calyx and four diverging stamens. Garden Thyme (*T. vulgaris*) is 6 to 10 inches high, with narrow, almost linear leaves, and whitish or reddish flowers, which grow in separate whorls, six in a whorl. It is a native of Mediterranean lands, is very commonly cultivated in gardens on account of its fragrance, and was introduced into Britain about 1548, or very probably at an earlier date. Wild Thyme (*T. Serpyllum*) has a procumbent stem with many branches, forming tufts, low and dense, a few inches to a foot wide, oval leaves and purplish flowers, arranged in whorls, which are united in a head. It is abundant on hills and mountains in Britain and in all parts of Europe and the north of Asia. It is less fragrant than garden thyme, but both species contain an aromatic essential oil. The flowering branches (*Herba Thymi* and *Herba Serpylli*) are used in medicine as a powerful stimulant, and those of garden thyme are also used in cookery for flavouring. There are several other British species. The Lemon Thyme, or Lemon-scented Thyme, of our gardens, is regarded as a variety of *T. Serpyllum*. It is generally of still lower growth than the common garden thyme. No species of thyme is indigenous in America. Thymol, an antiseptic phenol, can be obtained from oil of thyme by distillation. Commercially it is got from Ajowan seeds (*Carum copticum*).

Thymeleaceæ, a family of plants, of which the Mezereon and Spurge Laurel (see DAPHNE) are familiar examples. This family consists chiefly of shrubs, with a few herbaceous plants, natives mostly of the warmer temperate countries. Poisonous properties prevail. The bark is in general very caustic.

Thymol. See THYME.

Thymus Gland, a gland which begins to form at an early period of embryonic life, and, commencing as an epithelial ingrowth from the throat, extends from the neck right into the chest, where it is placed anteriorly in the mediastinum. It continues to grow for two years after birth, but before adult life is reached it shrivels to a small mass. When examined microscopically it is seen to consist of a tissue very similar to that of a lymphatic gland, and in this tissue are (Hassall's corpuscles) nests of concentrically arranged epithelial cells, probably the remnants of that epithelium of which the gland, at an earlier period, was almost entirely composed. The gland when fully developed is what may be called a blood-gland, for it is connected with the rest of the system by blood-vessels and nerves alone, unlike the liver or kidneys, which are provided with ducts through which their secretion is carried away. Regarding the function of this gland almost nothing is known. It probably is concerned, in some way, in altering the chemical or cellular structure of the blood. Numerous extractives, such as leucin and tyrosin, are found normally in it, and from it a substance can be extracted which acts as a powerful blood coagulant. It is possible, too, that in its substance the blood-cells may to some extent be produced. Its early development and rapid disappearance suggest that its chief activity is called into play during that period of life when growth and tissue formation are most active.

Thyroid Gland, a gland which arises in the early human embryo as an ingrowth from the lower part of the pharynx. This extends down to the lower part of the neck, and its original connection with the pharynx is lost. In the adult it is found as a bilobed structure on either side of the windpipe, and joined in front of this tube by an isthmus of gland-tissue. It is ensheathed in connective tissue, which passes into its interior, supporting and separating from one another the delicate structures within. The gland is a ductless gland, but is richly supplied by blood-vessels, which ramify around the tiny glandular capsules of which it is composed. If a section of the gland be examined with the microscope, it is seen that there is a vast number of tiny spherical cavities lined by short cubical cells; and within and entirely filling these cavities, there is a structureless-looking and very insoluble jelly. In the walls of the little cavities the dense Anastomosis (q.v.) of blood-vessels is seen. We are very much in the dark as to the meaning of this structure, and the parts played by the epithelial cells and the jelly in the function of the gland. That the gland is important is proved by the injurious effects which follow its removal, and by the fact that in connection with several diseases the gland is swollen and altered in structure. In some animals, the dog for instance, the jelly within the capsules is often found to contain red blood-corpuscles. The activity of the gland is intimately connected with the presence of iodine in the body, and depends upon a substance known as thyroxin, which has only in recent years been isolated. That the gland has something to do with the blood seems very evident, but what part it exactly plays is not yet

certain. If the gland be excised, in some animals, curious mucous degenerations are found to follow the operation and a tendency to mucous deposits and tumours seems to be associated with disease of the gland. An atrophic state of the gland produces deposits of mucous material throughout the tissues of the body, with feelings of coldness, mental and physical lethargy, and nutritional changes in the skin; this condition is known as myxœdema. A similar set of changes, accompanied by great failure in bodily and mental development, is sometimes found in children, and is associated with defects in this gland: the condition known as cretinism. When the gland hypertrophies, or without great increase in its bulk when its secretory activity is greatly increased, various nervous symptoms, such as tremors in the muscles, excitability, and over-action of the heart, may ensue, the condition being known as exophthalmic goitre. In other cases of enlargement none of these symptoms are present, the condition being then known as simple or endemic goitre. See GOITRE; also CRETINISM, MYXŒDEMA.

Thyrostraca, another name for Cirripedes.

Thysanoptera, an order of insects with very narrow, fringed wings, and imperfectly suctorial biting jaws. They are minute insects that feed on the juices of leaves and flowers, &c., well known by the name of Thrips. See INSECTS (*Classification*).

Thysanura, an order of wingless insects of small size. They undergo no metamorphosis. The abdomen usually bears peculiar structures, which seem to be abortive limbs, and the name Thysanura or bristle-tails refers to terminal appendages which are sometimes long and hairy. See SPRING-TAILS; and Sir John Lubbock (Lord Avebury), *Monograph of the Collembola and Thysanura* (Lond. 1873).

Tian-shan ('Celestial Mountains'), a great mountain-system, consisting of several ridges, mostly parallel, in central Asia, extends from the Pamir (q.v.) to the north of the Tarim depression in Turkestan, and occupies the frontier region between Russian territory on the north and the Chinese dominions to the south. In Khan Tengri it reaches 22,800 feet. See ASIA, p. 492.

Tiara, the triple crown of the pope, which is considered to be symbolical of his temporal, as the keys are of his spiritual authority. It is composed of a high cap of gold cloth, encircled by three coronets, with a mound and cross of gold on the top. The original papal crown consisted of the cap alone, the word *tiara* having long been synonymous with *mitra*. It is not certain when the first and second princely crowns were added; the first is said to have appeared by the beginning of the 12th century, the second to have been added by Boniface VIII. during his pontificate (1294–1303)—though some attribute it to the time of Innocent III. (1198–1216)—while the third is first mentioned in an inventory of 1315, and appears in the effigy of Benedict XII. (*d.* 1342). See a book by Müntz (Paris, 1898).

Tiara.

Tibbu, a people of the Sahara (q.v.).

Tiber (Ital. *Tevere*, Lat. *Tiberis*), the chief river of Central Italy, and the most famous in the peninsula, rises in a dell of the Tuscan Apennines (in the province of Arezzo), about 11 miles N. of the village of Pieve Santo Stefano. Its course until it reaches Perugia is south-south-east; thence, as far as Rome, it pursues, along an irregular zigzag line, a southern direction; but when it enters the plain of the Campagna it curves south-south-west, and enters the Mediterranean by two branches, which enclose the Isola Sacra. Of these the northern was constructed by Claudius when he made his harbour on the right bank of the Tiber (see OSTIA); it was altered by Trajan, and is now called the Fossa Traiana, while the name Fiumicino has been transferred to the little town at its mouth. The northern branch alone is navigable; the Fiumara, the southern branch, is blocked by sandbanks. The entire course of the river is about 260 miles—only 145 direct from source to sea. The most celebrated towns on or near its banks are Perugia, Orvieto, Rome, and Ostia; and its chief affluents are the Nera (with the Velino) and the Aniene (*Anio*) or Teverone from the left, and the Paglia with the Chiana from the right. In its upper course it is rapid and turbid, and of difficult navigation. It is navigable for boats of fifty tons to the confluence of the Nera, 100 miles from its mouth, and small steamers can ascend to within 7 miles of that point. The Tiber is supplied mainly by turbid mountain-torrents, whence its liability to sudden overflowings of its banks; even the oldest Roman myth, that of Romulus, being inseparably associated with an inundation. Its waters, too, are still discoloured with yellow mud, as when Virgil described it—*Vorticibus rapidis et multa flavus arena*—and it brings down so much solid matter that it is rapidly advancing the coastline at and on each side of its mouths—a matter of 13 feet per annum at the northern branch. At the southern mouth there were salt-marshes from early Roman days until 1875 (those on the right bank were probably still older), but the whole area has now been drained. See ROME; and W. Davies, *The Pilgrimage of the Tiber* (2d ed. 1875).

Tiberias. See GALILEE.

Tiberius, the second emperor of Rome (14–37 A.D.), whose real character remains to this day among the enigmas of history. Tiberius Claudius Nero was the son of T. Claudius Nero and of Livia, and was born 16th November 42 B.C., four years before her complaisant husband yielded Livia to the triumvir Octavianus. He was nine when his father's death transferred him to the tutelage of his step-father, and eleven when that step-father became the undisputed master of the Roman empire. Being now a member of the imperial household, he received a careful education and the same public honours as were paid to the nephew and grandsons of Augustus. At nineteen he filled the quæstorship, became prætor at twenty-five, and consul at twenty-nine. But almost the whole of his first twenty years of manhood were spent in the camp—in Spain, Armenia, Gaul, Pannonia, and Germany. He had the honour of bringing back the standards lost with Crassus; in 15 B.C. he co-operated with his brother Drusus in subduing the Rhæti and Vindelici; warred with the Pannonians (12–9), and in the campaign that followed the death of Drusus traversed Germany between the Rhine and the Elbe. The young Marcellus, nephew of Augustus, had died in 23; Agrippa, son-in-law of Augustus, died suddenly in 12, leaving only two boys of eight and five between the step-son and the succession. Augustus, urged by Livia, compelled (11) Tiberius to divorce his much-loved wife Vipsania Agrippina, daughter of Agrippa by his former wife Pomponia, in order to marry Agrippa's widow Julia, the profligate daughter of Augustus. Hardly was he married than he was sent to crush a revolt in Dalmatia and Pannonia; Drusus died in 9, and Tiberius marched at the head of his funeral train on foot in mid-winter from the Rhine to Rome, returning immediately to the wars in Germany, for the successes in which he was rewarded with the full

triumph (9) and other honours. But suddenly in 6 he retired to Rhodes, where for seven years he gave himself to study and to astrology. The open profligacy of the wife who had been forced into his arms was perhaps the most powerful reason which drove him from Rome to the displeasure of the emperor. Before his return (2 A.D.) the infamous Julia was banished to Pandataria (2 B.C.), and within the two years after the deaths of both the young princes Lucius and Gaius (2 and 4 A.D.) paved the way for the adoption of Tiberius as heir to the imperial dignity, the third grandson, Agrippa Postumus, being at once too young and too incompetent for command. He was now formally adopted by Augustus. Tiberius spent the next seven years in active service in north Germany against Maroboduus, in quelling formidable insurrections in Pannonia and Dalmatia, and finally in securing the frontier and taking vengeance upon the enemy who had annihilated the army of Varus in 9 A.D. Along with Germanicus he made two marches into the heart of Germany (9–10), returning to enjoy a splendid triumph (12).

On the death of Augustus at Nola in 14 Tiberius succeeded without opposition. He was fifty-six years old, taciturn, impenetrable, suspicious, beloved by none, yet respected by all for his gravity of demeanour and the reputed severity of his virtue. The first eight years of his reign are treated by Tacitus in the first three books of his *Annals*, and are reluctantly admitted to have been marked by just and moderate government, respect for the laws, frugality, and care for the interests of the provincials. The whole is set down to sustained hypocrisy—a theory of human character hardly to be accepted without hesitation. During this period only twelve state trials for *majestas* ('high treason') are recorded. The next period of the reign, treated in the fourth book of Tacitus, covers the six years 23–28. As yet, according to Tacitus, the evil impulses of Tiberius were restrained by the influence of his still surviving mother. The number of trials for *majestas* has grown to twenty, the espionage of informers has also increased as well as the severity of sentences. His minister Sejanus has grown to vast influence through playing for his own ends upon the morbid suspiciousness of his master. For the last period of the reign, covering eight years and a quarter, we miss the lost fifth book of Tacitus for the years 30–31. The sixth book opens near the close of the year 31, and brings the story of Tiberius through the six years' reign of terror in which 80 to 100 lives perished mostly by direct mandate of the prince down to its shameful close in the foul debaucheries, the gloom, and the insanity of Capreæ.

Such is the gloomy drama of the reign of Tiberius in the splendid pages of Tacitus. It only remains to be seen what are the historically reliable elements of the story. In general terms it may be said that the facts are mainly trustworthy, if the motives imputed cannot always be accepted. There is no doubt that for some years Tiberius took, or affected to take, little active part in public affairs, and indeed throughout one of the deepest principles in his Roman nature was regard for constitutional forms. But his care for the real interests of the provincials was an element new to Roman politics, and showed a foresight and statesmanship to which Augustus had not risen. The only important open changes he made were the permanent encampment of the imperial guard close to the city walls, and the abolition of the old *comitia*, the election of public officers being transferred to the subservient senate. But the one fatal feature of the reign was the institution of the *judicia majestatis*, which grew up out of the slavish adulation of the senate, the deep suspiciousness of the emperor's own nature, and the subtle manner in which this was fed by Ælius Sejanus, commander of the prætorian guards. *Delation*, or denunciation of individuals by informers, soon grew to great proportions, and men breathed in a constant atmosphere of terror. In 26 Tiberius left Rome for Campania, and the year after took up his abode in Capreæ, where Suetonius tells us he wallowed in brutish sensualities. He had given his entire confidence to Sejanus, leaving him the whole control of government; but at length awakened to the ambitious designs of his minister, he struck him down without hesitation (31). Macro, the successor of Sejanus, had all his vices without his talents, and so the state of affairs was even worse than before. The murder of Agrippa Postumus in 14, the mysterious death of Germanicus in the East (19), the poisoning of Tiberius' own son Drusus by Sejanus (23), the banishment of Agrippina and the untimely death of her young sons Nero and Drusus (31 and 33) were some of the dark tragedies that befell the house of Augustus under the reign of Tiberius. In his last years the emperor's mind was darkened by gloom, superstition, and perhaps insanity. The famous words Tacitus has preserved of a letter to the senate (*Ann.* vi. 6) seem like a momentary flash of revelation of more than mere remorse: 'May all the gods and goddesses destroy me more miserably than I feel myself to be daily perishing, if I know at this moment what to write to you, senators, how to write it, or what, in short, not to write.' On the 16th March 37 his worn-out frame fell into a sort of lethargy, in which he is said to have been suffocated by Macro to prevent his recovery.

The original authorities are Tacitus, Suetonius, and Velleius Paterculus. The first admits that the history of Tiberius was 'falsified, while he reigned, through terror, and written after his death with the irritation of a recent hatred.' Whether the portrait he has himself constructed with such consummate literary art is psychologically possible or no, there can be no doubt at least that his own feeling was too bitter to permit of a judicial estimate. Suetonius as a historical writer shows no discrimination in choosing his materials, and his fondness for scandal and gossip was far stronger than his zeal for truth. Velleius Paterculus had served under Tiberius, but his overdone panegyric gives the fatal suggestion of flattery. Dion Cassius again wrote nearly two centuries after Tiberius, and was wise enough to follow Tacitus pretty closely, the character of Tiberius being a study much too complex for his powers of analysis. Dean Merivale in his *History of the Romans under the Empire* defends Tiberius with moderate zeal, believing him at least the victim of much ancient misrepresentation; Professor Beesly (*Catiline, Clodius, and Tiberius*, 1878) repudiates the whole account by Tacitus as a deliberate and malignant libel; and J. C. Tarver in *Tiberius the Tyrant* (1902) treated him as a ruler of great wisdom and benignity, but the most bitterly maligned of men. M. Bossier summed up against him in *L'Opposition sous les Césars* (1875).

Besides these, see Mommsen's *History of Rome;* Furneaux's edition of the *Annals;* Baring-Gould's *Tragedy of the Cæsars;* and books on Tiberius by Pasch (1866), Freytag (1870), Stahr (1873), Ihne (1892), and Tuxen (1896).

Tibesti, a fine mountainous country in the east of the Sahara, between 12° and 20° E. long., in an elevated region whose summits reach more than 11,000 feet above the sea. It is inhabited by the pastoral Tebu. See SAHARA, p. 12.

Tibet, or THIBET (native name, *Bod*), is the European name for the region of central Asia, the most elevated extensive country in the world. It is bounded on the N. by Chinese Turkestan (Sin-Kiang), the Chinese province of Kansu; on the E. by the Chinese provinces of Kansu, Sze-chwan; on the S. by the Chinese province of Yunnan, Burma, Assam, Bhutan, Sikkim, Nepal; on the W. by

Kashmir and British India. The Chinese claim suzerainty over Tibet, but the Tibetans have asserted their independence since 1912. The isolation of the country has been due partly to its unique geographical position, and partly to the mistrust and dislike shown by the inhabitants towards foreigners in general.

Physical Features.—The area of Tibet has been variously estimated from 440,000 to 1,000,000 sq. m. (a very probable figure being 750,000 sq. m.), but not only are the boundaries ill-defined and exact information unobtainable, but certain territories in eastern Tibet are sometimes regarded almost as independent 'marches.' Tibet is a huge tableland with an average altitude of 15,000 feet above sea-level, and with chains of mountains running east and west, and rising to 25,000 feet. There are three main physical divisions. Northern Tibet, where the tablelands are loftiest, covers more than half of the country, and is bounded on the north by the Kuen Lun and Altyn Tagh ranges and by the steppes of Tsai-dam, while on its south side a huge massive range drops to the valley of the Tsangpo river. This arid, cold, and unproductive territory acts as a watershed, the Kiria, Cherchen, and other rivers flowing north into Chinese Turkestan, and there are many lakes dotted about. Southern Tibet includes the valleys of the Indus and Sutlej to the west and of the Tsangpo (known as the Brahmaputra after it enters India) to the east, while eastern Tibet, where rise the Hwango-ho, Yang-tse-kiang, Mekong, and Salwin rivers, is the least elevated and most fertile region. The Himalayas form the great southern boundary. Lakes, with no permanent outlets and often exceedingly salt, are a feature of the country, the largest being those of Koko Nor in the far NE. and Tengri Nor less than 100 miles NW. of Lhasa, with areas of 1630 and 1000 sq. m. respectively, while that of Hora Tso (118 sq. m.) in the NW. is the highest lake in the world, 17,390 feet above sea-level. There is evidence that a process of subsidence has gone on and is continuing. The climate of Tibet is very severe, but on the whole dry, as the Himalayas break the rain- and snow-bearing clouds from the ocean, the limit of perpetual snow being on the average about 20,000 feet. Lhasa has some 14 inches of rain per annum, and the atmosphere is everywhere clear and rarified. The summer is short, and the midday sun, especially in the Tsangpo valley, is exceptionally strong, but the winter and night colds are intense. While the lower lands are bracing, the great northern tableland has a terrible climate, and fierce wind-storms are common. Animals are very abundant everywhere in Tibet, and leopards, bears, wolves, deer, lynxes, foxes, hares are found, as well as yaks, sheep, mules, dogs, goats, and partridges, wild-duck, pheasants, &c. are numerous.

In the inhospitable northern steppes there are no trees, much boggy land, and very little vegetation except some short grasses, but the valleys of the Indus and Tsangpo basins are comparatively fertile, and Himalayan conditions prevail in the SE., where fruits and vegetables are produced to a certain extent, and there are extensive forests. Barley is almost the only crop of any importance, but there is a little wheat, and the southern pastures provide good grazing ground. The mineral resources of Tibet are considerable, especially in the east, and gold, borax, and salt are worked; gold and iron are found more or less everywhere, and oil-wells are supposed to exist; bricks are made from the clay soil, but there is no coal in the country. The Tibetans are good blacksmiths and cutlers, but their chief industrial occupation is the preparation of woollen cloth. They are active traders, and large caravans, in which yaks, camels, and sheep are the beasts of burden, are constantly traversing the country on their way to the great fairs in Tibet and the entrepôts of the surrounding countries. The exports to China and India include wool, borax, musk, live-stock, and the imports from China include silk and tea, and from India cotton piece goods and grain. The principal trade-routes, all radiating from Lhasa, are as follows: westward through Shigatsé and southern Tibet to Srinagar in Kashmir; northward by the Koko Nor to Urga in Mongolia; eastward by Tachienlu to Pekin; southward through Gyantsé, Phari, Yatung to Kalimpong near Dárjiling. This last route carries the heaviest traffic, but there are other routes to India. River transport is only used to a small extent. Since 1922 a telegraph line of some 144 miles connects Lhasa with Gyantsé, where there is a British trade agent (see *History*).

People and Social Life.—Estimates of the population of Tibet vary from 1½ to 6 million, but a figure between 4 and 5 millions might be reasonably accepted. The population is largely nomad, but villages and monasteries contain settled communities, south-eastern Tibet being the most populous region. The capital, Lhasa (q.v.), on the river Nyang, is supposed to have a population of 20,000 (largely increased at festivals, pilgrimages, &c.), and the other chief towns are Gyantsé, Shigatsé, both on the river Kyi, with populations of 15,000 each. (The Nyang and the Kyi are tributaries of the Tsangpo.) The Tibetans are a Mongolic race, much more closely allied to the Burmese than to the Chinese or the Mongols proper. They are broad-shouldered and muscular, but short in stature, and present a striking contrast to the weak-calved Hindus. They have Mongol features, but not in an exaggerated form. The Tibetans by race people nearly the whole of Tibet. A few nomads, Mongol and Turkish tribes, have penetrated into the northern steppes, and some Chinese have colonised the south-east. The inhabitants of Ladakh (part of Kashmir) and of Bhutan, and the ruling classes of Sikkim belong ethnographically to Tibet. At the head of the government is the Dalai Lama, residing at the palace of Potala in Lhasa. The election of the Dalai Lama, who wields both spiritual and temporal authority, is curious. He is regarded as one of the reincarnations of the Buddha, and after the death of each Dalai Lama the principal religious authorities in the country seek for divine guidance in the choice of a successor, always a boy of not more than three or four years of age. A regent is appointed to govern till the pontiff comes of age at eighteen. The Dalai Lama is assisted by the *Kashak* or cabinet of ministers, consisting of the *Lönchen* or prime minister and four *Shapés* or secretaries of state. The Kashak also acts as a court of appeal, and has powers of legislation, though the latter theoretically belong to the *Tsongdu* or national assembly, comprising the great and the small assemblies, and consisting mostly of monks. Tibet is divided politically into fifty-three districts, each ruled over by two governors, one a monk, the other a layman. In the provinces almost feudal conditions prevail. The government obtains a revenue from taxing salt, hides, wool, tea, and from the profits of the mint now established at Lhasa, while taxes are often paid in kind, but financial arrangements are still fairly primitive. There is a small army, armed with Lee-Enfield rifles and organised on British models.

Most of the Tibetans belong to the particular type of Buddhism called Lamaism (q.v.), which has its centre in Tibet, and it is estimated that

lamas or monks number a fifth to a fourth of the total population. The monks live in monasteries (which may contain anything up to 10,000 inmates), and are bound to a life of celibacy and abstinence, but many of them are said to be quarrelsome, idle, and dissolute. They belong largely to the sect of the 'Yellow Hats' (see *History*). There are also some nunneries. The abbot of Tashilumpo Monastery, near Shigatsé, known as the Tashi Lama, and still the titular king of the province of Tsang, is the second pontiff of Tibet. Nominally the two great lamas have equal privileges, but though the Tashi Lama still retains his spiritual authority he has no political power. In eastern Tibet a form of Shamanism has some adherents, and some Christian missionaries have begun working from China.

The Tibetan language is South Mongolian and related to the Burmese; it has a regular alphabet, but there are three different vocabularies and styles of address corresponding to the social position of the person addressed, and dialects are common. Tibetan as spoken now differs considerably from the old written language. Books abound, and every monastery has its library. The literature, the best of which dates from the 9th to the 14th century, is mostly of a religious nature, consisting largely of translations from Sanskrit, and many of the manuscripts are very valuable. The priesthood are taught to read and write, but there is, of course, a vast amount of illiteracy among the lower classes. In Tibet, owing to its isolation, many archaic customs survive. One of these is polyandry, the husbands of one wife being generally brothers. This custom seems fairly universal among the poor, while some of the rich practise polygyny, but divorces are not unknown. The Tibetans are said to be intelligent, but without initiative; different views have been taken of their moral character, but on the whole they seem to be kindly and truthful, courteous and punctilious on questions of etiquette, but superstitious in many of their beliefs, and filthy in their habits. They are very fond of music and dancing, and the women wear jewelry, especially coral and turquoise. Wool is used for clothing (also silk by the upper classes), while the food mostly consists of mutton, barley, tea, and butter (from yak's milk).

History.—The aboriginal Tibetans were a warlike and barbaric race (writing, for instance, being unknown till the 7th century). The earliest date which can be relied on as historical is 639 A.D., when the king Sbrong-tsan-Sgam-po introduced Buddhism from India, and founded Lhasa. His dominions extended from the Himalayas north to the Koko-Nor Lake. Later, the Tibetan country is said in the Chinese annals to have extended to the Gulf of Bengal, then described as the Tibetan Sea. Ti-song De-tsen and Ralpachen were powerful kings in the 8th and 9th centuries respectively. In the 9th century a war broke out with China which terminated in 821, when bilingual tablets still existing were erected at Lhasa. At the end of the 10th century the Tibetan monarchy broke up into provincial kingdoms, but in 1026 the Indian Buddhist Atisha settled in Tibet and promoted the religion enormously. Kublai Khan, who annexed Tibet to his vast empire in 1270, called to his court a Tibetan monk, Phagspa. The latter, who converted his patron and the Mongols to Buddhism, was given the sovereignty of Tibet, and for about seventy years the country was under the rule of a line of priest-kings, to be succeeded by the monarchy founded by Chang-chub Gyaltsen, which lasted some 300 years. In 1390 the reformer, Tsong Kapa, dissatisfied with the laxness of the Buddhist priesthood, founded the stricter sect of the 'Yellow Hats' (as opposed to the unreformed 'Red Hats'), and the former have remained paramount from the 15th century to the present day. In the 16th century the titles of Dalai Lama and Tashi Lama emerge. The first four Dalai Lamas were purely religious leaders, but the fifth made himself temporal ruler of Tibet in 1641 with the help of the Tatars. In 1720 the Chinese, after many struggles, finally made Tibet a vassal state, and appointed two *ambans*, or political agents, in Lhasa. The Dalai Lamas (always chosen when children) of the 19th century hardly survived their majority, so that the power rested with the ambans and with the regent, the latter drawn from the ranks of the higher clergy. The thirteenth Dalai Lama (born 1876) has reigned since 1893, and the ambans were dismissed in 1912.

Meanwhile the isolation of Tibet remained the same. Individual Capuchin and Jesuit priests penetrated to Lhasa in the 17th and 18th centuries, while the first Englishman to enter Tibet was Bogle, sent by Warren Hastings in 1774. In 1840 Ladakh was conquered by the Maharaja of Kashmir, and is now a British dependency. In 1854 there was a struggle between Tibet and Nepal which ended in a treaty by which both countries recognised the suzerainty of China. Eleven years later, in consequence of the refusal of the Tibetan authorities to allow Europeans to enter their country, a system was organised in the interest of science, by which pundits or educated Indians were sent as explorers into Tibet. By this means the old maps were corrected, and much valuable geographical knowledge was obtained. Prjevalski and other Russian explorers did for northern Tibet what the pundits did for the south. Sikkim, a frontier state through which passes the important route from India into Tibet, became a British dependency in 1850. In 1888 it was attacked by a Tibetan force, and, as the Chinese government declined to interfere, the invaders were repelled by Anglo-Indian troops. The non-observance by the Tibetans of the Anglo-Chinese Sikkim convention of 1890 (opening a trade 'port' at Yatung), and their refusal to meet commissioners, led to the military mission of 1904 under Sir Francis Younghusband, which penetrated, after sharp fighting, to Lhasa. The Dalai Lama had fled to Mongolia (and later did homage to the emperor at Peking), but the treaties of 1904, 1906, 1907 established trade marts at Yatung, Gyantsé, and Gartok (the last being in the extreme west of Tibet and connecting with Simla), respected the suzerain rights of China, and insisted on the territorial integrity of the country (also indirectly opposing Russian influence, which up to then had been on the increase). The Dalai Lama returned to Lhasa in 1909, but from 1910 to 1912 lived in India, as result of the Chinese efforts to strengthen their diminishing power in Tibet. The Chinese revolution gave the Dalai Lama his chance to sweep away the whole Chinese administration in 1912. The political situation remains uncertain. A conference in 1913 between Britain, China, and Tibet proved abortive, and hostilities between the last two powers were renewed (1917–18). On the two occasions when the Dalai Lama was forced to leave his country, he was officially deposed by the Chinese, and the Tashi Lama set in his place. There has been friction between the courts of the two great lamas, and in 1925 the Tashi Lama fled to Peking. A rapprochement with Britain has been a marked feature of Tibetan history since the Younghusband expedition, but the strip of land that forms the trade-route between Yatung and Gyantsé is the only part of Tibet that is really open for foreigners (Yatung being 8 miles on the Tibetan side of the Tibet-Sikkim frontier).

See LAMAISM, LHASA, and the books there cited. Most of the travellers who have entered Tibet have written books, scientific, descriptive, or official, on the country, and the list of explorers round about the last quarter of the 19th century includes Abbé Desgodins, Bonvalot, Bower, Taylor, Littledale, Wellby, Deasy, Rijnhart, Rawling, and the Russians, Prjevalski, Roborovsky, and Kozlov. But see more especially Abbé Huc (q.v.), *Voyage en Thibet* (1850: new ed. trans. 1898); Markham, *Missions of Bogle in 1774 and Manning in 1811* (1876); Rockhill, *Land of the Lamas* (1891), and other books; Chandra Das, *Journey to Lhasa and Central Tibet* (1899); important books by Sven Hedin (q.v.), including *Adventures in Tibet* (1904), *Trans-Himalaya* (3 vols. 1909–13), *Southern Tibet* (9 vols. 1917–22); Grenard, *Tibet* (trans. 1904); Waddell, *Lhasa and its Mysteries* (1905); Sandberg, *Tibet and the Tibetans* (1906), and other books; Holdich, *Tibet the Mysterious* (1906); Younghusband, *India and Tibet* (1910); Farrer, *On the Eaves of the World* (1917); Ward, *Mystery Rivers of Tibet* (1923); Sir C. Bell, *Tibet* (1924); McGovern, *To Lhasa in Disguise* (1924); Stötzner, *Ins unerforschte Tibet* (Leipzig, 1925); Mrs King, *We Tibetans* (1926); Madame David-Neel, *My Journey to Lhasa* (1927). See also the relevant books cited at (Chinese) TURKESTAN. Both Tibetan-English Dictionaries and Grammars have been published by Cosma de Körös (1834), Jäschke (1881, 1883), Bell (1921), while the *Tibetische Studien* (1851–68) of Schiefner, the Tibetan-English Dictionaries of Ramsay (1890), Chandra Das (1902), the Handbooks by Sandberg (1894), Henderson (1903) are useful; see also Woolf, *Three Tibetan Mystery Plays* (trans. 1924).

Tibet Dog. See MASTIFF.

Tibullus, ALBIUS, was probably born at Gabii about 54 B.C. His prænomen and parentage are unknown; his estate was much reduced in the subsequent confiscations by which Octavian and Antony rewarded their legionaries. His father seems to have died early, but his mother and sister survived him. While still a youth he acquired the friendship of the orator, poet, and statesman, M. Valerius Messala, head of a literary coterie only less attractive than that of Mæcenas. As in Queen Anne's day, literature was a direct passport to office under government, and the already marked poetic gifts of Tibullus procured him a place on the staff of Messala commissioned by Augustus, 30 B.C., to crush a revolt in Aquitania. In this campaign the poet displayed capacity enough to win him distinction and decorations, but these could not countervail his repugnance to a soldier's life. Accordingly the close of the war found him dividing his time between the society of Rome and the retirement of Pedum at the base of the Tusculan and Sabine hills. He fell in love with a 'grass widow,' Plania by name, whose husband was on service in Cilicia. Under the sobriquet of Delia she is the heroine of his first book of elegies, but his devotion did not survive the deception she practised on him, finding as he did that he was not her only lover. It was during the earlier period of this attachment that, at Messala's instance, he started with that statesman on a mission to Asia; but, having sickened on the voyage, he got no farther than Corcyra. In his second book of elegies 'Delia' is replaced by 'Nemesis'—this *innamorata* being a fashionable courtesan, with many other admirers besides Tibullus, who bemoans his bondage to her and stigmatises her rapacity, but yet cannot bring himself to drop her.

Tibullus died 19 B.C., immediately after Virgil, universally deplored in Rome, and years afterwards the subject of a magnificent elegy by Ovid. Doubt has been thrown on his identity with the Albius of Horace, but we are loth to part with the picture that poet gives of him, pacing pensively his woodland walks at Pedum, blessed with fortune, with personal beauty, and with all the capacities of refined enjoyment. His character, amiable, generous, loyal to his friends and constant to the mistresses who deceived him, but wanting in strength and energy, is reflected in his poems, which, 'most musical, most melancholy,' by their limpid clearness and their unaffected finish still justify Quintilian in placing him at the head of Roman elegy properly so called. Grace, tenderness, pathos, conveyed in verse smooth without monotony, can, however, only abate, not remove, the impression he leaves of lack of the dramatic force characteristic of Propertius or of the masterly range commanded by Ovid. The third book can hardly, even in part, be considered as his, while the fourth, also by another hand, is yet memorable for the eleven poems on the loves of Sulpicia and Cerinthus—Sulpicia's being unique as specimens of a Roman lady's passionate outburst in verse.

Till Lachmann's edition (1829) not much was done for the text of Tibullus, though his interpretation has advanced but little beyond the older Heyne. The most critical and useful editions are those of Bährens (1878), Muller (1880), Postgate (1905; new ed. 1914). See also Postgate's *Selections* (1903), and Ribbeck's *History of Latin Poetry;* the Rev. James Davies, *Catullus, Tibullus, and Propertius* ('Ancient Classics' series, 1876); Teuffel; and Sellar. The best complete English translation is Dr James Cranstoun's (Edin. 1872), but there are noble fragments by Elton (1814).

Tibur. See TIVOLI.

Tic Douloureux. See NEURALGIA.

Tichborne, a Hampshire property, 2 miles SSW. of Alresford station and 6½ E. by N. of Winchester. It has from before the Conquest been the seat of the Tichbornes, a Catholic family who received a baronetcy in 1626. After the death of the eleventh baronet, Sir Alfred Joseph Tichborne (1839–66), a butcher from Wagga Wagga in Australia, Thomas Castro, otherwise Arthur Orton of Wapping, came forward to personate an elder brother, Roger Charles Tichborne (1829–54), who had been lost at sea off the coast of America. His case collapsed on 6th March 1872, the 103d day of a trial to assert his claims; and the 'Claimant' was on 28th February 1874, the 188th day of his new trial, whose cost was £55,315, sentenced to fourteen years' imprisonment with hard labour for perjury. He died 1st April 1898. See Sir Alex. Cockburn's Charge (2 vols. 1875), Atlay's *Tichborne Case* (1916).

Ticino, a river of Switzerland and the north of Italy, rises on the southern slopes of Mount St Gothard, and flows south through Lake Maggiore, and south-south-east through the north of Italy to its junction with the Po, 4 miles below Pavia (which in Roman times took its name from the river). For the last 75 miles of its course, from the point at which it leaves Lake Maggiore, it is navigable. For the battle here in 218 B.C., see HANNIBAL. It gives its name to a Swiss canton (see below).

Ticino (Ger. *Tessin*), the southernmost canton of Switzerland, bounded on the W. and S. by Italy, and on the E. by Italy and the canton of Grisons. Area, 1082 sq. m.; pop. (1920) 152,256. Its surface forms a portion of the southern slope of the Alps. In the south the country falls away into hills, and the scenery becomes Italian in character. The principal river is the Ticino (q.v.); and the canton is traversed by the St Gotthard railway. In the north cattle-breeding and the preparation of dairy-produce are the chief employments. Further south there are chestnut groves and vineyards. The olive-groves that existed till a century ago have totally disappeared, and fruit culture has been much neglected, the young men preferring work in northern countries and South America. Maize is the staple field crop. The northern part of Lago Maggiore and about one-half of the Lake of

Lugano are included within the canton. The inhabitants speak Italian, and are Catholics. The largest town is Lugano; since 1881 Bellinzona is the capital.

Tickell, THOMAS, poet, was born in 1686 at Bridekirk in Cumberland, and had his education at Queen's College, Oxford, a fellowship of which he held (without orders by dispensation) from 1710 till 1726. His complimentary verses on *Rosamond* (in Tonson's Sixth Miscellany, 1709) gained him the favour, his own virtues the friendship of Addison, who introduced him both into the world of letters and public life, and on becoming in 1717 Secretary of State made him his under-secretary. He held the office of secretary to the Lords Justices of Ireland from about 1725 till his death, at Bath, 23d April 1740. He was skilful and timeous in occasional poetry, as in *The Prospect of Peace* under Queen Anne, and *The Royal Progress* at the arrival of George I., and he was puffed with all the partiality of affection in the *Spectator*. The most memorable incident in his life was his translation of the first book of the *Iliad* about the same time as the first part of Pope's *Homer*. Addison declared that the rival versions were both good, but that Tickell's was the best that ever was made. Pope believed, or professed to believe it the work of Addison himself, deliberately prepared to eclipse his version, and wrote in reply the famous satire on Atticus. But there need be no doubt that Tickell made his own translation, although Addison corrected it, as he confessed he did. Tickell's 'letter to Avignon,' says Johnson, 'stands high among party poems; it expresses contempt without coarseness, and superiority without insolence.' His longest poem is *Kensington Gardens;* his most popular, the ballad of *Colin and Lucy;* his finest, the exquisitely sincere elegy on Addison prefixed to his edition of Addison's Works (4 vols. 1721).

Ticket of Leave. See PRISONS.

Tick Fever. See RED-WATER, TICKS.

Ticknor, GEORGE, the historian of Spanish literature, was born in Boston, 1st August 1791, the son of a wealthy New Englander, who was one of the first importers of Merino sheep into the United States. He graduated at Dartmouth College (1807), and was admitted to the bar (1813), but, having practised for a twelvemonth, became convinced that the life of a lawyer would not satisfy his ideas of usefulness or happiness. He accordingly turned his thoughts to plans of study and travel, and, starting for Europe in 1815, for four years resided successively in London, Göttingen, Paris, Geneva, Rome, Venice, Madrid, and Lisbon. Everywhere he mixed in the best society; and his journal is full of the best sort of interviewing, his friends and acquaintances then or afterwards including Joanna Baillie, the Duc de Broglie, Chateaubriand, Miss Edgeworth, Goethe, Guizot, Hallam, Lord Holland, President Jefferson, Jeffrey, Longfellow, Lyell, Macaulay, Metternich, Milman, Prescott, Rogers, Scott, Sydney Smith, Southey, Earl Stanhope, Mme. de Staël, Talleyrand, Thackeray, Daniel Webster, and Wordsworth. Returning to America, he became professor of French and Spanish and of the Belles Lettres in Harvard University. In 1835 he resigned his chair, and went with his family to Europe, where he remained three years, collecting materials for his great *History of Spanish Literature* (3 vols. New York, 1849), an exhaustive and admirable work, which has been translated into Spanish and German. Other works by him were Lives of Lafayette (1824) and Prescott (1864), with fourteen reviews and minor writings. He received nearly a score of literary distinctions; in 1856 revisited Europe; and died in Boston, 26th January 1871, in his eightieth year. See his *Life, Letters, and Journals* (2 vols. 1876).

Ticks (Ixodidæ and Argasidæ), two families of mites (Acarina) the members of which attack man, mammals, birds, and reptiles. They are the largest Acarina, some being an inch long. They seem usually to pass from herbage or brush on to passing animals, and some can live for four years without food. The flattish body has a firm chitinous cuticle; the legs extend laterally and the movements are somewhat crab-like. There is a movable 'false head' or capitulum which bears a pair of sharp cutting cheliceræ, a fixing 'hypopharynx' with recurved teeth, and a pair of pedipalps which serve in part as a sheath for the foregoing parts. In the leathery Argasidæ both sexes swell up greatly when they gorge themselves with blood. In the Ixodidæ there is a hard dorsal shield, absent in Argasidæ, which covers the whole body of the male and prevents distention. In the female the shield is a small anterior patch, so that great distention is possible, and with eggs as well as with blood. The males seem to require much less food. In the carefully studied South African 'Bont' tick, *Amblyomma hebræum,* the female courts the male until he becomes excited and introduces his rostrum into the female aperture. When an egg is extruded by the female Amblyomma's ovipositor, a bi-lobed vesicle appears from beneath the anterior border of the shield, and grips it, manipulating it for some minutes. The vesicle is then withdrawn and the egg is left on the rostrum. Without manipulation the eggs shrivel up. When the satisfied female of Ixodes drops off the host, she returns to the herbage and begins to lay eggs. Dr A. D. Michael says 'she places the eggs one by one in front of her in a pile or round ball, which gradually becomes almost as large as the mother-Ixodes. It is probably this position of the eggs which gave rise to the idea held by some of the earlier writers that the Ixodes laid their eggs through the mouth-opening; the fact being that the genital opening is very near the mouth, and the position during oviposition such that the mouth is not readily seen.' But it must be noted that in Ixodes also there is a 'manipulation' of the eggs and a temporary attachment to the rostrum. Among the Ixodidæ may be noted the common English sheep-tick (*Ixodes ricinus*); the cattle-ticks (*Boophilus*), one of which (*B. annulatus*) transmits Texas fever; *Rhipicephalus sanguineus,* which disseminates a dog disease; and *Amblyomma hebræum,* which causes 'heart-water' in South African cattle. The Argasidæ, which have free leg-like pedipalps and no shield, are represented by the closely related genera Argas and Ornithodoros. Human 'tick-fever' on the Congo is transmitted by *Ornithodorosmoubata;* a disease in poultry is conveyed by *Argas reflexus* and *A. persicus;* the latter also attacks man. As the hasty removal of the tick is certain to leave the

Fig. 1.—*Ixodes ricinus,* fem.: *a,* mouth; *b,* opening of oviduct; *c,* anal valves; *d,* stigma.

Fig. 2.—Upper and under surfaces of *Argas reflexus.*

rostrum in the wound, the pest should be stimulated with a drop of turpentine or benzole. As these examples show, ticks have turned out to be of unsuspected importance, not so much in themselves, as because of the Protozoon parasites which they disseminate—the result being human diseases like tick-fever and stock-diseases like 'heart-water' in South African cattle.

What is often called sheep-tick (Melophagus; see SHEEP-KED) is a Dipterous insect, and to the same order belong the species of Nycteribia on bats and of Ornithomyia on birds. The 'death-tick' is a popular name for Pseudoneuropterous insects of the family Psocidæ—e.g. Psocus, Cæcilia, and Clothilla—or for the little Death-watch (q.v.; Anobium).

See ACARINA; also A. Pagenstecher, *Beiträge zur Anatomie der Milben* (Leip. 1860-61); P. Mégnin, *Les Parasites et les Maladies Parasitaires* (Paris, 1880); A. D. Michael, *British Oribatidæ* (1884), and monograph on Ticks by Prof. Nuttall and others (Cambridge, 1908, *et seq.*).

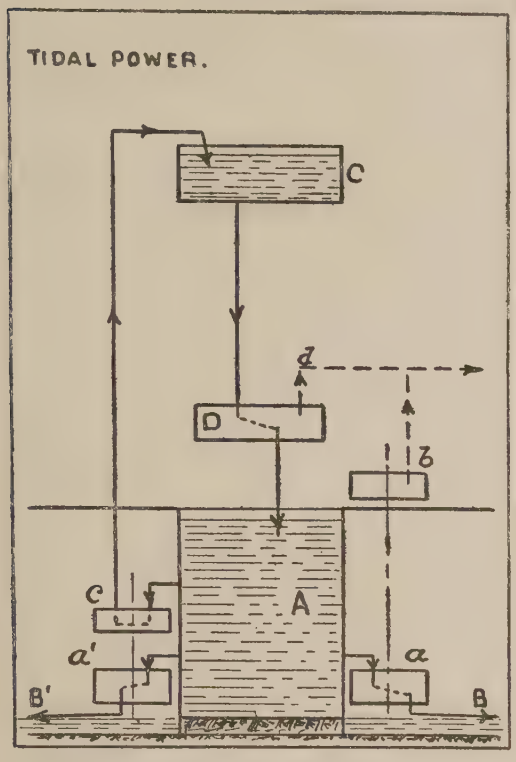
Ticonderoga, a township of New York, 100 miles by rail north of Albany on Lake Champlain, and enclosing the outlet of Lake George, whose falls supply water-power. There are manufactures of pulp and paper; black lead and iron are mined; and there is some lumbering; and here the lake steamers start. Pop. 2000. Here the French built a fort in 1755, which, after repulsing a first attack in 1758, they dismantled and abandoned in 1759, along with Crown Point. The English enlarged and strengthened both fortresses at a cost of £2,000,000; but, being garrisoned with only 50 men after the cession of Canada to Great Britain, it was in 1775 surprised and captured by Ethan Allan. In 1777 it was recaptured by Burgoyne, and in 1780 it was again occupied by the British. At the close of the war it fell into ruins, but its restoration was undertaken in 1909. See Cook's *History of Ticonderoga* (1858).

Tidal Power. From time immemorial the Tides (q.v.) have done work useful to man in navigation; and the idea of making them do other useful work, in the development of mechanical power, heat, or light, for instance, has often engaged the attention of the scientist and inventor. 'Tide-mills' have indeed been constructed in the past in this country and elsewhere, but they have not been of any practical importance.

The fact of tidal energy, which is a particular manifestation of the energy of the rotation of the earth, is obvious to anyone who watches the tide rise. It is strikingly illustrated in many of the estuaries of this country. In some of these situations it is possible to select a point where, at the time of low-water, the bed of the estuary is exposed, and, in a little more than six hours, find that point covered to a depth of thirty feet or more by tidal water lifted there by the tidal force. If at this stage, that is, at the moment of high-water, and at that point, we could drop across the estuary a screen which would hold up the water above while that below ebbed away in the tidal movement, then in another six hours and a few minutes, that is, at the moment of low-water, there would be left a reservoir of tidal water more than thirty feet deep at the 'screen' and perhaps several square miles in area. Such a body of water, by virtue of its height, at the time of low-water of the tide, above the tide-way below the 'screen,' would represent a certain potential energy; that is to say, the energy is there, stored up, if means can be devised to turn it into useful work. It is not likely that any method will ever be found by which the whole of such apparent potential energy may be utilised, any more than it has been found possible to utilise the whole of the potential energy of coal or oil in the development of mechanical power; but a large proportion of that potential, tidal, energy may be turned into useful work—mechanical power, heat, light. To attain this end we have but to arrange for as much as possible of the water in the reservoir to be run out through suitable machines—hydraulic turbines—which will transform the potential energy of the stored-up water into mechanical power which, again, may be changed into electricity, heat, or light as desired. Such an elementary tidal-power system, consisting of a tidal reservoir A, and the tide-way BB′, is indicated in the diagram appended. It will be clear that so long as there is a free run for the water of the reservoir through the turbines into the tide-way, the turbines may go on developing power until the water in the reservoir has fallen to the level of the turbines, or until the tide, rising below the 'screen' (a dam or barrage), reaches the level of the water in the reservoir, when the system will cease to function—in practice it would cease a little sooner. Nor, in such an elementary power system, can the turbines resume working until the tide, after refilling the reservoir, has fallen sufficiently to provide the necessary 'head' to operate the turbines, that is, a sufficient difference between the level of the water inside and that outside the reservoir. Hence, for a considerable portion of each tidal period of twelve and a half hours, such a system could not function. It is, however, absolutely essential that any public power-station must be able to supply power at any hour of the day or night; and, moreover, must be able to meet a varying demand for power, which rises to a maximum, the 'peak,' about a certain time daily. In a tidal power-station this time will occur periodically, just when the tide cannot provide directly any power at all. Hence, some means of storing tidal energy to carry the power-station over such dead tidal periods must be provided. Here we touch the chief technical difficulty in the utilisation of tidal energy.

Two methods of overcoming this difficulty have been proposed, of which one may be called the multiple tidal reservoir system. Various modifications of the system are possible, and under it the tide may be used both on the flow and on the ebb; but the essential feature of all consists in the provision of space—a spare reservoir or more than one—which is used to receive the discharge from the turbines during those portions of the tidal interval when, as already explained, that discharge can no longer be passed into the tide-way directly. The spare reservoir is emptied in due course when the tide permits; and the water accumulated in it may be used to develop power as it flows away. This system was examined by the Ministry of Transport in 1920, when that authority prepared a tidal-power scheme for the estuary of the Severn, but was abandoned in favour of the other and less complex system. In this latter system, which may be called the high-level storage system, only one tidal reservoir is needed, and while, under it, the tide may be used both ways, the balance of advantage seems to be in favour of using the tide only on the ebb. The distinguishing feature of this system, which is illustrated in the diagram, consists in the provision of one or more storage reservoirs situated conveniently to the tidal works, but at some elevation above them. So long as the tide serves, a certain number of turbines will generate electricity which will pass directly into the distribution system; but at the same time other turbines will be pumping tide-water to the high-level storage which will feed a secondary power-house, D, where electricity will be generated during those portions of the tidal period when the tide does not serve directly. It happens that the pumping of water,

especially on a large scale, is one of the simplest and most highly efficient of mechanical operations; while, at practically every place on our coasts where tides occur that may be worth utilising, sites are available for high-level storage. The system is simple and has many recommendations.



A, Tidal reservoir; B, B', Tideway; C, High-level storage; D, Secondary power station; a, a', Primary power turbines; b, Electricity generator of primary power station; c, Pumps lifting water to high-level storage; d, Electricity from secondary power station.

It permits, for instance, advantage to be taken of abnormally high tides, and even of inland floods, to accumulate power which may be used later as required. It is this system which was particularly in view in the government inquiry set up by the Labour government of 1924, acting on the report of the Water Power Resources Committee, into the possibilities of tidal power in this country, more especially in the estuary of the Severn, where tides range up to more than forty feet, and are only exceeded in height in two other places in the world. There can hardly now be any question that ultimately, and perhaps before long, the tides in this country will be utilised in the development of power. The question is obviously one of great national importance, especially in view of the cheap and abundant water-power which some of our world competitors command. If the tides can be utilised in the development of power, then no other industrial country possesses such favourable conditions for that development as may be found on the coasts of Great Britain. See WATER.

Tides. The tides consist in the alternate rising and falling of the surface of the sea and in the associated ebb and flow of the currents. At most places, and speaking roughly, the water reaches its highest level twice each day and its lowest level at times which are about half-way between those of high-water. At the great majority of places the clock-times of high- and low-water vary from day to day. Thus, if high-water occurs at noon on Sunday, it may occur at about one o'clock on Monday, and shortly before two o'clock on Tuesday. By the following Sunday high-water will occur about six o'clock, and after a second week it will again occur about noon. At such places the average interval of time between two successive high-waters is 12 hours 25 minutes, but the interval varies considerably during the course of the fortnight. The heights of high- and low-water at the same place may also vary much from day to day. For example, on one particular day the water will rise very high and fall very low; a week later the high-water will come considerably short of the highest attainable, and the low-water will not fall as low as the lowest attainable. After the lapse of another week the very high and the very low waters will again occur, and so on. For any one place on the shores of Great Britain, and speaking roughly, tides which occur at the same clock-times will rise and fall to the same heights. In such cases the greatest and least tides are distinguished as *spring-* and *neap-*tides respectively. For the days just before and just after spring-tides, the interval from one high-water to the next will be less than the average, while for the days just before and after neap-tides it will be greater than the average. These phenomena are known as *priming* and *lagging* respectively. At certain places in the East Indian seas high-water occurs at practically the same clock-time every day, while at certain places in the China Sea there is usually only one high-water each day. At many places outside Atlantic waters the two tides of the day reach markedly different heights, a phenomenon called *diurnal inequality*. At London Bridge the range (i.e. the difference in level between successive high- and low-waters) has an average value of 21 ft. at springs, and of 14 ft. 11 in. at neaps. At Leith the corresponding average ranges are 16 ft. 1 in. and 8 ft. 3 in. respectively. At the head of the Bay of Fundy the range reaches 50 ft., while at certain of the Pacific islands and over much of the Mediterranean it never exceeds 2 ft.

For an accurate study of the tides at any one place, a recording machine called a *tide-gauge* is used. When the place is on the coast, the customary form of gauge utilises a float resting on the surface of water in a well to which the sea has access. A cord is attached to the float and transmits the motion to a pencil bearing on a drum which is rotated by clockwork. When the place is off shore, the varying pressure of the load of water on the sea-floor is usually measured.

It is found that the sequence of tides at any one place bears a most intimate relation to the positions of the moon and sun relative to the earth. Thus, the period of 12 hours 25 minutes is half that of the moon's apparent revolution round the earth, while the sequence of tides from springs to neaps is associated with the phases of the moon. At certain places in Canadian waters the chief variation in the range of tide is associated with the varying distance of the moon from the earth, while at others it is associated with the varying declination of the moon. The diurnal inequality is always associated with the declination of the moon or sun. The most complete correlation between the sequence of tides and astronomical variables is provided by the *harmonic analysis* of tidal observations. This consists in decomposing the tides at any place into a number of simple tides, each constituent having a constant period

and range. When the tides at any place have been correlated with astronomical variables, it is possible to make *predictions* regarding future tides at that place. In this way tables of the times and heights of high- and low-water, of the heights of water at all hours, or of the times of minimum tidal current are made. In the construction of these tide-tables the harmonic method is much used, and most of the necessary calculations are made by a special machine first imagined by Lord Kelvin. In this machine there is a pulley corresponding to each harmonic constituent, and the range and phase of the motion of its centre can be adjusted to correspond with the results of the analysis of observations. A cord with one end fixed passes round all the pulleys so that its free end shows the addition of all the constituents.

The physical nature of the forces which generate the tides was first revealed by Newton. Let M be

the centre of the moon and E that of the earth. Then E moves with an acceleration towards M determined by the moon's gravitational force at E, while a particle of water, P, has an acceleration depending on the moon's gravitational force at P, combined with that of the earth itself and the reactions of the sea-floor and neighbouring water. The tides consist in the motion of the water relative to the land, and so we consider the acceleration of P relative to E. For this we require the excess of the moon's attraction at P over that at E, and so the tide-generating force is obtained by combining the moon's attraction at P with a repulsion of direction, ME, and magnitude equal to the moon's attraction at E. This repulsion represents the effect of the inertia of the water owing to the acceleration of the solid earth towards M. Of course the velocity of the solid earth is perpendicular to ME. Imagine a sphere, CD, described with M as centre and passing through E. Then over CAD the tide-generating forces will be attractive, while over CBD they will be repulsive. But owing to the reaction of the sea-floor only the horizontal components of the tide-generating forces will count, and it is clear that over CAD these components will be directed towards A, while over CBD they will be directed towards B. Now the sun as well as the moon will raise tides, and it is a consequence of the law of gravitation that the tide-generating forces due to these two bodies are directly proportional to their masses and inversely proportional to the cubes of their distances from the earth. The separate attractions at E and P are inversely proportional to the squares of the distances ME and MP, but the difference between the two is inversely proportional to the cube of ME, approximately. Now the sun's mass is nearly 27,000,000 times the moon's mass, and the sun's distance is about 390 times the moon's distance. Consequently the sun's tide-generating forces are to the moon's in the ratio of 27,000,000 to 390^3, i.e. roughly, 5 to 11. The distribution of the disturbing forces over the oceans is most simply specified by a statement of what the tides would be if the water could instantaneously take up a position of equilibrium. The slope of the surface of the water would then be always such that the consequential differences of pressure produced horizontal forces balancing the tide-generating forces. It is clear that due to the lunar forces the water-surface would slope upwards from CD towards the points A and B, as shown in the figure. The points A and B would follow the moon in its apparent daily course, with the result that twice every lunar day high-water and low-water would be experienced at most points of the ocean. An exception would occur at the North Pole, whose position relative to M is not affected by the diurnal motion of the earth. This specification of forces is known as the *equilibrium-form* of the lunar tides, and a corresponding specification applies to the solar forces.

In considering how far the actual tides will have the properties of the equilibrium-form, we first remark that, owing to inertia, continual balance between pressure-differences and disturbing forces is not possible, and the actual tides are not represented directly by the equilibrium-form. It is a general dynamical principle, however, that forces which alternate in a definite period produce motions which alternate in the same period. This is Laplace's principle, on which Lord Kelvin founded the harmonic methods of analysis and prediction. The periods of the harmonic constituents are calculated from the equilibrium-form, but the ranges and phase-lags are obtained from the actual tides. When solar high-water coincides with lunar high-water we have the phenomenon of spring-tides, and when solar low-water coincides with lunar high-water we have the phenomenon of neap-tides. In the equilibrium-form spring-tides occur at new and full moon and neap-tides at the quarters, but in the actual tides these phenomena usually occur a day or two later. Near springs the shorter solar period shortens the period of the resultant tide and we have the phenomenon of priming. By examining the sequence of the two tides near neaps the reader will easily see the reason for lagging. If at a certain place the lunar tide vanishes and the solar tide does not, then high-water will occur at the same solar time every day. A gradual increase or decrease in the range of the generating forces will produce a gradual increase or decrease in the range of the tides, though the two changes will not in general be simultaneous. We thus see that the magnitudes of the lunar and solar tides will vary with the distances of the moon and sun from the earth. When the moon is not on the equator it is easy to see that the two daily tides of the lunar equilibrium-form will not be equal, since the points A and B will cross the meridian of the place at different distances from the place. It follows that the actual lunar tides will generally experience a diurnal inequality which goes through a period with the moon's declination, and there will be a similar effect in the solar tides. On the harmonic method the diurnal inequality is represented by the introduction of constituents with periods of about a day, and when the diurnal constituents become greater than the semi-diurnal constituents we may have only one high-water each day.

The chief features of the tides of such bodies of water as the Irish Sea and the English Channel have been explained on the principles of dynamics. These tides are largely maintained by those of the ocean and are much influenced by the earth's rotation. For example, when the current flows with its maximum speed north through the southern Irish Channel the surface of the water is 5·7 feet higher on the Welsh coast than on the Irish coast. The effect is reversed when the current flows south, and in consequence the range of tide is 11·4 feet greater on the Welsh side than on the Irish side. In suitable circumstances high-water on one side of a channel may be simultaneous with low-water on the opposite side, an example of which occurs on the opposite coasts of England and Holland.

Tidal currents are resisted by the friction of the sea-floor, and the consequent dissipation of energy occurs principally in shallow seas. The effect is a kind of friction-brake gradually retarding the rate of the earth's rotation, and it has been calculated that in consequence the day has probably been lengthened by a second in the last 120,000 years.

The tide-generating forces are of course operative on the main body of the earth as well as on the water of the oceans. The elastic distortion of the solid earth has been detected and measured in several ways. It is possible that the tidal stresses in the earth's crust may be a minor factor in the production of earthquakes.

In the evolution of worlds tidal action has had a very important influence. When the main body of the earth was fluid, the body-tides would also be resisted by frictional forces. A change in the rate of the earth's rotation must be accompanied by changes in the distance and time of revolution of the moon. Calculating backwards, Sir G. H. Darwin found that the moon must at one time have been much nearer the earth than at present. Previous to the time of its existence as a distinct satellite it is believed that the moon formed part of the earth and that its separation was due to the tidal action of the sun. It is calculated that the joint fluid or partially fluid body would have a time of natural oscillation nearly equal to the tidal period, so that very great oscillations would result until the final separation of the body into two parts. The tidal action of the earth upon the moon has long ago compelled the latter to keep a constant face towards the former. For there can be little doubt that before the moon had cooled down to its present unchangeable condition, very large tides must have been generated in it, and these would act as a friction-brake so long as the period of the moon's axial rotation was shorter than its time of orbital revolution. All satellites whose rotation-periods are known actually keep the same faces towards their primaries, and the planet Mercury has probably had its day made equal to its year by the friction of its solar tides.

The most satisfactory theory of the origin of the planets themselves also appeals to tidal action. It makes the hypothesis that a star passing near the sun raised such enormous tides in the latter that the matter of the present planets was drawn out.

Tideswell, a small town of Derbyshire, 6½ miles E. of Buxton, with an old cruciform church, some cotton manufactures, lime-kilns, and stone-quarries. Pop. 2000.

Tieck, JOHANN LUDWIG, one of the most prominent champions of Romanticism (q.v.) in Germany, and the friend of Novalis and the Schlegels, was born in Berlin on 31st May 1773. Most of his life was spent in that city, in Dresden, and near Frankfort-on-the-Oder, his life's calling being that of a man of letters; and in Berlin he ended his days, on 28th April 1853. After two or three immature romances, he struck out a new line in clever dramatised versions of the old fairy-tales, such as Fair Eckbert, Puss in Boots, The Faithful Eckhart, Blue Beard, and others, which he made the vehicle for some polished satire on contemporary literature. This is Tieck's peculiar groove. He followed up this first success—*Volksmärchen von Peter Lebrecht* (1797)—by publishing the tragedy *Leben und Tod der Heiligen Genoveva* (1800), the comedy *Kaiser Octavianus* (1804), and *Phantasus* (1812–17), a collection of the same class of traditional lore in story and drama. These books became great favourites in Germany, owing to the simple and agreeable style of the narrative, and the dreamy fancy and delicate irony that pervaded them. Another great favourite was a romance in glorification of old German art, entitled *Franz Sternbalds Wanderungen* (1798). In his later years Tieck wrote several works of a more modern cast, of which *Die Gemälde*, *Die Reisenden*, *Die Verlobung*, *Hexensabbath* are amongst the most highly esteemed. Besides superintending the completion of A. W. Schlegel's translation of Shakespeare's plays—it was long erroneously believed that he had translated them himself—he edited the doubtful plays and wrote a series of essays (*Shakespeares Vorschule*, 1823–29). *Don Quixote* he did translate with his own hand (1799–1804). He holds an honourable place in the ranks of Germany's dramatic and literary critics, in virtue of his *Dramaturgische Blätter* (2d ed. 1852) and *Kritische Schriften* (1848). Tieck's *Schriften* were published in 20 vols. in 1828–46, his *Novellen* in 12 vols. in 1852–54, and his *Nachgelassene Schriften* in 2 vols. in 1855. There are editions of *Ausgewählte Werke* by Welti (8 vols. 1886–88), Klee (3 vols. 1892; containing a biography), and Witkowski (4 vols. 1903). Some of his fairy-tales and novels were translated into English by Carlyle and Thirlwall. See works by Köpke (1855), Friesen (1871), Stern (1879), Minor (1884), Steiner (1893), Bischof (1897); and Carlyle's *Essays*, vol. i.

Tiel, a Dutch town in Guelderland, on the Waal, 60 miles E. by S. of Rotterdam. It has a trade in fruit and cattle. Pop. 10,600.

Tiele, CORNELIS PETRUS, Dutch theologian, was born at Leyden, 16th December 1830, studied at the university there and at the Remonstrants' seminary at Amsterdam, and became Remonstrant pastor at Rotterdam (1856), professor in the seminary translated to Leyden (1873), and professor of the History of Religions in the university of Leyden in 1877. From its foundation in 1867 he collaborated with Kuenen, Loman, and Rauwenhoff in editing the well-known *Theologisch Tijdschrift*. Tiele published a long series of important theological works, including *Comparative History of the Egyptian and Mesopotamian Religions* (1869–72; trans. 1882); *Outlines of the History of Religion* (1876; trans. 1878); *Babylonisch-assyrische Geschichte* (1886–87); *West Asia in the Light of Recent Discovery* (1893; trans. 1894); the Edinburgh Gifford Lectures on *The Elements of the Science of Comparative Religion* (1897–99); besides a number of contributions to the *Encyclopædia Britannica* and the *Encyclopædia Biblica*. He died on the 11th January 1902.

Tienen. See TIRLEMONT.

Tien-tsin, a large city and river-port of China, in the province of Chih-lî, on the right bank of the Pei-ho, 34 miles from the mouth of the river, and 80 miles SE. of Peking. It stands at the junction of the Pei-ho and the Grand Canal. The river is generally frozen over for several months each year, but the difficulties of transport are largely surmounted by the use of the railway from Tien-tsin to Taku at the mouth of the river, and by employing ice-breakers. The flooding of the river and of the Grand Canal in 1917 and 1924 caused great havoc in Tien-tsin and in the surrounding districts, but under the River Commission and the Hai-ho Conservancy Board the waterways are being improved and the embankments strengthened. Tien-tsin was connected with Peking by rail in 1897, and stands on the Peking-Mukden and Peking-Nanking lines. It is the principal commercial centre for the six northern provinces of China as well as for large tracts of Chinese Turkestan, Mongolia, and Manchuria. The trade of the town is mostly in raw cotton, wool, hides, furs, carpets, seeds, oil, candles, glass, perfumery, dyes, &c. A spirit,

which is called 'wine,' is distilled on a large scale locally from millet, while other industries are salt-evaporation and cotton-spinning. The city walls were demolished in 1901 and replaced by boulevards, and the city has handsome gardens and a race-course. By the treaty of Tien-tsin, signed here in 1858, the port was declared open; and a British consulate was established in January 1861, while part of the allied troops were still here (see CHINA). Tien-tsin gained an ominous reputation by the ruthless massacre of the French Sisters of Mercy in June 1870. In 1900 the town, taken by the allies, became the base of operations against Boxers and Chinese. The population estimates vary from 800,000 to 2,000,000.

Tiepolo, GIOVANNI BATTISTA, the last of the great Venetian school, was born at Venice 5th March 1692, and modelled himself on Paul Veronese. His first works were in the adornment of churches and palaces in and about Venice; in 1750–53 he executed a great series of frescoes in the archiepiscopal palace at Würzburg, and in 1760 was engaged on the palace of Madrid. At Madrid he died, 27th March 1769. He was a most productive painter, rich in colour (especially in his easel pictures), and clear (though incorrect) in drawing. His chief works were the Old Testament histories—the palace at Udine and the frescoes at Madrid. His two sons were also painters, and like their father etchers also. See Molmenti, *Il Carpaccio e il Tiepolo* (Turin, 1885).

Tierney, GEORGE (1761–1830), Whig politician, was one of Pitt's most persistent opponents, and fought a bloodless duel with him (1798). He held office in the ministries of Addington, Grenville, Canning, and Goderich. He was a clever debater, notorious for his powers of sarcasm.

Tierra del Fuego consists of a group of several large and numerous small islands, lying off the south extremity of South America, in 54° S. lat., 70° W. long., and separated from the continent by the Strait of Magellan. Its farthest south point is formed by Cape Horn. The principal island, Tierra del Fuego, sometimes known as King Charles South Land, is divided between Chile and the Argentine Republic, to the latter of which Staten Island also belongs. All the other islands and islets are included in Chile. The shores of the archipelago are generally much broken by and indented with bays and arms of the sea, with mountains rising abruptly from the water. These fjords, as a rule, contain deep water at their shoreward extremities, with bars, or, more properly, banks at the sea entrances; in this feature, as well as in their scenery, resembling many of the salt-water lochs on the west coast of Scotland. The whole group is mountainous, the mainland (Tierra del Fuego) attaining a height of 7000 feet, the snow-line being 4000 feet above sea-level. There are some dreary plains and a few fertile river-valleys, with areas of marshy ground between Useless and St Sebastian Bays. None of the rivers are important, unless it be the Juárez Celman, which is believed to be navigable for a considerable distance above its mouth. Towards the north the plains produce good pasturage, and attempts at sheep-farming made in the district have since been profitably extended to other parts of the archipelago. Cattle are also raised. Forests of *Nothofagus pumilio*, *N. betuloides*, *N. antarctica*, Winter's bark, *Fitzroya patagonica*, *Libocedrus tetragona* cover large areas, with dense growths of such bushes as *Berberis microphylla* and *B. ilicifolia*, *Escallonia serrata*, *Ribes magellanicum*, *Embothrium coccineum*, *Myrtus Nummularia* on the hill slopes. Lichens grow abundantly at greater heights, and cover much of the low grounds, where apparently nothing else can flourish. Very characteristic is the xerophytic umbellifer *Azorella glebaria*, which forms the balsam-bogs. It grows in dense, hard, pale yellowish green hemispherical hillocks, which in warm weather give forth a faint aromatic smell, while drops of white gum flow from them. Each mass springs from a single seed, and is the result of perhaps hundreds of years of growth. The more common and old-fashioned English garden flowers come to perfection in the settlers' enclosures in the extreme north. Few island groups situated so close to continental land exhibit a poorer fauna than is here presented, the guanaco, tucu-tucu (a small rodent), dog, fox, and rat being the only quadrupeds, with the exception of the lately introduced farm stock. The dog is semi-domesticated, and is kept by the natives in immense numbers. Birds, however, are abundant and various, including *Vanellus cayanus*, *Surnia funerea*, owls, falcons, and a great variety of sea-birds. Seals and sea-lions, once almost innumerable along the shores, have grown scarce and wild, especially in the northern portion.

The land of Tierra del Fuego is rapidly rising, and the coast-line has advanced 3 kilometres since the date of the surveys of Captains King (1826–28) and Fitzroy (1831–36). The rocks are principally volcanic, but sedimentary strata are not uncommon on the principal island, and probably on some others. Granite, syenite, porphyry, quartz, serpentine, trachyte, diorite, and sandstone comprise the principal rocks. Some coal, of a poor description, and a little gold have been found. The situation of the islands exposes them to a series of conditions which render their climate the most tempestuous in the world. The prevailing winds are from the west, beginning to blow with the rise of the sun, and increasing in violence until dusk, when a calm may generally be looked for with confidence. During the short summer the winds blow from the north. Settled weather never lasts for more than a fortnight at a time. December, January, and February are the warmest months. March is exceedingly boisterous always, and during its course occur the most destructive gales.

The people are savages of a low type, divided into three tribes, the Onas (or Aonas), the Yaghans, and the Alakalufs, the Yaghans being now supposed to be the aborigines. The Onas are tall, the others short and stunted in stature. They were estimated at 10,000 in 1870, but are now reduced to about 600. The charge of cannibalism was unfounded. Argentine Tierra del Fuego including Staten Island, forms a territory with some 3000 inhabitants; capital Ushuaia (1000). In Chilean Tierra del Fuego is the small town of Porvenir, opposite Puentas Arenas (pop. with district 2000, largely Yugoslav).

See Burney, *Voyages*, ii.; Fitzroy, *Survey of the Straits of Magellan;* Macdonall, *Voyage to Patagonia;* Weddell, *Voyage towards the South Pole;* Snow, *Two Years' Cruise;* Darwin, *Voyage of a Naturalist;* Popper, *Exploration of Tierra del Fuego;* Margrim, *La Terre de Feu;* Cunningham, *Straits of Magellan;* Coppinger, *Cruise of the Alert;* Ball, *Notes of a Naturalist;* Reports of French Transit of Venus Expedition (vol. vii. 1892); J. R. Spears, *The Gold Diggings of Cape Horn* (1895); Conway, *Aconcagua and Tierra del Fuego* (1902); de Agostini, *Zehn Jahre im Feuerland* (1924); Koppers, *Unter Feuerland-Indianern* (1925).

Tiers État. See STATES GENERAL.

Tietjens. See TITIENS.

Tiffin, capital of Seneca county, Ohio, on the Sandusky River, 43 miles by rail SSE. of Toledo. It is the seat of Heidelberg College (Reformed Church; 1851), and manufactures machinery, farming implements, bricks, glass, pottery, wagons, &c. The surrounding district is rich agriculturally. Pop. 14,000.

Tiflis (Georgian *Tpilisi*), capital of the republic of Georgia and of the Transcaucasian federation, formerly of the Russian government of Tiflis, on the banks of the Kûr, 165 miles as the crow flies ESE. of the Black Sea. Since 1883 it has been connected by rail with Batum on the Euxine and Baku on the Caspian, and is the chief centre of trade between Russia and Persia. The old city, which consisted of three distinct parts, and which traces its history as the capital of the Georgian princes back to the 5th century, has been greatly metamorphosed since the Russian occupation in 1795 and annexation in 1802. It is now divided into quarters assigned to the various nationalities, and possesses handsome public buildings, churches, schools, libraries, and observatories. A university was founded in 1918. In the middle ages the metal-workers of Tiflis were famous for their skill in engraving and inlaying, and their influence made itself felt in the brass-work of Venice; and to the present day the silversmiths and gunsmiths of the city maintain their character for excellence. Otherwise its manufactures (carpets and other textiles) are unimportant. In its neighbourhood are naphtha and thermal springs. Pop. 347,000, of whom many are Armenians. See CAUCASUS, GEORGIA.

Tiger (*Felis tigris*), a well-known feline Carnivore, belonging to the same genus as lion and leopard, lynx and cat, puma and jaguar. It seems most nearly related to the lion, from which it hardly differs except in superficial characters, such as the colour-striping and the absence of a mane, and in trivial skeletal features, especially of teeth and skull. In distribution the tiger is exclusively Asiatic, and has been found 'in almost all suitable localities south of a line drawn from the river Euphrates, passing along the southern shores of the Caspian and Sea of Aral by Lake Baikal to the Sea of Okhotsk. Its most northern range is the territory of the Amur, its most southern the islands of Sumatra, Java, and Bali.' Westwards it reaches to Georgia, and eastwards to the island of Sakhalin. 'It is absent, however, from the great elevated plateau of central Asia, nor does it inhabit Ceylon, Borneo, or the other islands of the Indo-Malayan Archipelago, except those above mentioned.' The tiger may exceed the lion in length. Adult males measure 5½ to 6½ feet from the nose to the root of the tail, and the tail measures about 3 feet. The females are rather smaller. Blandford gives authentic instances of tigers over 10 feet long (with the tail), and weighing nearly 500 lb. The predominant colour is bright rufous fawn or tawny yellow, and is barred by dark or black cross stripes; the under parts are whitish. In details the dark markings vary considerably. The favourite haunts of the tiger are grassy plains and jungle swamps, where its colour often harmonises most deceptively with that of the surroundings. The animal takes readily to the water and swims well; it can also, if circumstances press it, climb trees. Like other Felidæ, the tiger is a solitary hunter and stalks its prey stealthily till within the fit distance for making a final spring. It feeds on cattle, deer, wild hogs, pea-fowl, &c., and some old 'man-eaters' haunt the neighbourhood of villages on the outlook for human prey. 'The man-eater,' Mr G. P. Sanderson says, 'is often an old tiger (more frequently a tigress), or an animal that, through having been wounded or otherwise hurt, has been unable to procure its usual food. It is as cowardly as it is cunning, fleeing before an armed man, between whom and a possible victim it discriminates with wonderful sagacity.' Young tigers are said to glut their taste for blood far beyond the limits of hunger, and the same is true of the mother while the young are still her companions. Sir Joseph Fayrer reports that a tiger will in ordinary circumstances destroy one or two cows or buffaloes a week, refraining from fresh attacks until it has consumed the results of one night's work. In attacking a large animal, such as a bullock, the tiger seizes the nape of the neck with its teeth, holds the victim firm with its sharp claws, and with a powerful wrench dislocates the vertebræ. From two to six cubs are born at once, and these the tigress guards, feeds, and trains with all maternal care. They remain with her until nearly full grown, or about the second year. It is said that the male tigers are eager to destroy young male cubs; and apart from this occasional cannibalism is recorded. In some parts of the East tigers are numerous enough to endanger human life very seriously; and tiger-hunting is in these conditions 'a most noble sport.'

Tiger (*Felis tigris*).
(From a Photograph by Gambier Bolton, F.Z.S.)

For so-called tiger-cats see MARGAY, OCELOT, and SERVAL. The jaguar is the *tigre* of South America. Tiger-wolf is a name given to the spotted hyæna and to the Thylacine. 'Tiger-moth' is any of the Arctiidæ (whose larvæ are 'woolly bears'); and 'tiger-beetle' is a Cicindela (q.v.).

Tiger-flower (*Tigridia*), a genus of plants of the family Iridaceæ. There are about seven known species, natives of Mexico, Peru, and Chile, all bulbous plants, generally treated as half-hardy or greenhouse plants. The flowers are few, enclosed in a spathe. The perianth has a short tube with a six-parted spreading limb; there are three stamens united in a cylinder, a three-celled ovary with a filiform style which has three filiform bifid stigmas. The best known of the species in British gardens is *T. Pavonia*, which has been cultivated for 100 years for the beauty of its rather evanescent flowers. The flowers are orange, spotted tiger-like, hence the name.

Tiger-lily. See LILY.

Tiglath-Pileser, the name of several famous kings of Assyria (q.v.).

Tigranes. See ARMENIA, MITHRADATES.

Tigré, the northern division of Abyssinia (q.v.).

Tigris (Heb. *Hiddekel; Diklat* of the cuneiform inscriptions; *Tigrâ* in Old Persian, 'swift as an arrow,' whence Gr. *Tigris;* Arab. *Dijleh*), a large river of south-western Asia, rises south of Lake Goljik, in the mountains of Kurdistan, within a few miles of the eastern bend of the Euphrates (q.v.), flows south-east to Diarbekir, after which it makes a sharp turn and flows due east for 100 miles to Til. Here it receives from the north a considerable affluent, the Bitlis (united with the Bohtan Su), and once more altering its course runs in a south-easterly direction, mainly through desert wastes and unpeopled pastures, until it falls into the Persian Gulf, after a course estimated at 1150 miles. Its chief tributaries, beside the Bitlis, are the Great and Little Zab, and the Dyala, all from the left. At Kurna it joins the Euphrates, 90 miles above the mouth of that river in the Persian Gulf, and henceforth the united rivers bear the name of Shat-el-Arab (see EUPHRATES). In the upper part of its course the Tigris is a very swift stream, and it brings down great quantities of mud. The principal places on its banks are Diarbekir, Mosul, Samarra, and Bagdad, with the ruins of Nineveh, Seleucia, and Ctesiphon. The river is navigable for small steamers to Bagdad, and for river-boats to near Mosul.—For the Bocca Tigris, see BOCA TIGRE, and CANTON.

Tilburg, a town of Holland, 14 miles ESE. of Breda, is an important railway junction, and has extensive manufactories of calico, cloth, leather, soap, tobacco, &c. Pop. 68,000.

Tilbury Fort, in Essex, is situated on the north bank of the Thames, opposite Gravesend, and 22 miles E. of London. Originally erected in the time of Henry VIII. as a block-house, it was converted (1667) into a regular fortification after the bold expedition of De Ruyter into the Thames and Medway, and has been greatly strengthened since 1861. Here on 8th August 1588, more than a week after the dispersal of the Spanish Armada, Elizabeth reviewed her troops. Extensive docks have been constructed at Tilbury since 1882. See DOCK. Pop. (urban district) 6400.

Tilden, SAMUEL JONES, American statesman, was born the son of a farmer at New Lebanon, New York, 9th February 1814, studied at the University of New York, and was admitted to the bar in that city, and secured a large and important railway practice. By 1868 he had become the leader of the Democrats in the state, and he strengthened his position by the energy and determination with which he attacked and destroyed Tweed and his fellows (see TAMMANY SOCIETY). In 1874 he was elected governor of New York; in 1876 he was the Democratic candidate for the presidency (for the disputed election, see HAYES), and not only won general admiration, but possibly saved the excited country from something worse than fierce wrangling, by his temperate utterances and unselfish attitude. Twice afterwards his party would have nominated him had he been willing. He died 4th August 1886, leaving great part of his fortune of about $5,000,000 to found and endow a free library in New York City. There is a Life by T. P. Cook (1876), and editions of his writings and speeches by John Bigelow (1885 and 1908).

Tiles, plates of baked clay, of various shapes and patterns, according to their use, some being for roofs, some for facing walls, and others for pavements. Formerly, marble and stone slabs for covering roofs were sometimes called tiles. The small cubical pieces of burnt clay, stone, glass, or other material used for mosaic pavements are called tesseræ (see MOSAICS).

The manufacture of glazed tile-work dates from the ancient Babylonian, Assyrian, and Egyptian empires, was rather neglected by the Greeks, but was taken up extensively by the Romans especially for roof-tiles, two kinds of which were used together, one consisting of flat slabs and the other of semi-cylindrical ridges.

WALL TILES of a highly decorative character were made at least as early as the 12th century in Persia, and very probably for a long time before that. The manufacture was continued into the 17th century before the artistic merit of the designs declined, while the best work is probably to be seen at Isfahân. Many, if not most, of the earlier of these mural tiles have designs of a very effective but simple kind painted in enamel glazes of a coppery or dull golden colour, with sometimes a little blue or other tint added, the whole surface having a quiet but pleasing lustre. Others, perhaps a little later in date, while retaining some of this flat coppery painting, have in addition bold ornament and inscriptions in relief, further picked out from the light ground by deep blue or greenish-blue colour. The tiles of this class were of larger size, and were used for dadoes, large panels, and cornices or friezes, or a combination of both. They have generally a brilliant lustre, which varies their effect when viewed at different angles. Very beautiful wall tiles without lustre and with ornament somewhat different from the above, but still retaining a Persian character, were made at Damascus, Rhodes, and perhaps other places in the 16th century. The mosques of Damascus and other towns in the Levant, as well as those of Cairo, and buildings in Moorish Spain, contain splendid examples of wall-tile decoration; while both decorative and roof tiles were largely used by the Chinese and by the Indians, in the latter case culminating in the splendid work of the 16th and 17th centuries. Coloured tiles are also employed for covering the domes and towers of some churches in Spanish America (see, e.g., MONTEVIDEO).

ENCAUSTIC TILES, ornamented tiles made of earthenware and almost exclusively used for pavements, were made extensively over northern Europe from the 12th to the 16th century. Admirable examples are to be found in England, especially at Chertsey Abbey, Surrey, while Rouen and Nürnberg became famous centres of work, and later, the names of Luca della Robbia and Bernard Palissy stand out. In the 17th and 18th centuries, Delft in Holland achieved great renown for its glazed ornamental tiles, but generally speaking, after the 16th century, tiles came to be made by methods similar to those of pottery. With the revival of the industry at Liverpool in the latter half of the 18th century, and the establishment of firms like those of Minton (1844) and Maw (1850), large numbers of tiles were again produced.

Encaustic tiles are made by two quite different processes. By the older of these, which is a revival of that used in mediæval times, the clay is worked in a plastic state first into square blocks. These are cut into square slices or slabs by passing a wire through them; upon a slab so cut is put a facing of fine clay of the colour of the ground of the pattern—another layer of fine clay being added to the bottom to prevent warping. By means of metal containing-frames, fitting into each other, a plaster of Paris mould or reverse is pressed with a screw-press into the face of the soft tile, and thus indents the pattern. Clay of the requisite colour to form the pattern is now poured in a semi-fluid state into this depression, the tile being then set aside until dry enough to have its surface scraped. By this means the superfluous clay is removed, and the pattern is brought out clear and well defined, the two or more colours

of clay forming one smooth flat surface. The tile is then dried and fired.

The other process of making encaustic tiles is by the use of perforated brass plates and a screw-press (following Prosser's patent of 1840), and was patented by Boulton and Worthington in 1863. The device on the tile is first made by pressing clay dust into the perforations of a brass plate laid on a metal block; or if it is of more than one tint, then dust of two or more colours, with as many brass plates, is used to build up the pattern. The plates being removed, the clay powder which is to form the body of the tile is then filled into a mould round the device, and the whole consolidated by pressure, and fired as in the ordinary way.

See POTTERY, TERRA-COTTA; the relevant sections of the articles on the countries mentioned above; W. J. Furnival, *Leadless Decorative Tiles;* L. L. Jewitt, *Ceramic Art of Great Britain;* R. Forrer, *Geschichte der europäischen Fliesen-Keramik;* M. Shurlock, *Tiles from Chertsey Abbey;* L. Lefèvre, *Architectural Pottery* (trans. by K. A. Bird and W. M. Binns); E. Bourry, *Ceramic Industries* (trans. by W. P. Rix).

Tiliaceæ, a family of dicotyledonous trees and shrubs, or rarely herbaceous plants, mostly natives of the tropics, though a few are found in the temperate parts of the northern hemisphere. They have simple, alternate leaves, with stipules and axillary flowers. As the characters somewhat correspond with those of Malvaceæ, so do the properties of the family, which are generally mucilaginous and wholesome, the bark fibrous. Some species yield a light and useful timber, as the Lime (q.v.) or Linden tree. The *bast* of the lime-tree is valuable from its fibrous character; various Indian and American species are useful on this account, but the most important fibrous plants of the family are the species of Corchorus, which yield Jute (q.v.). *Sparmannia africana* is a favourite hot-house shrub, with sensitive stamens.

Till. See BOULDER-CLAY, PLEISTOCENE.

Tillandsia, a genus of Bromeliaceæ, some with the general habit of the family, others that of *T. usneoides,* described in the article BROMELIACEÆ.

Tillemont, LOUIS SÉBASTIEN LE NAIN DE, ecclesiastical historian, was born in Paris, 30th November 1637, had his education from the Port-Royalists, and early devoted himself to historical studies. He entered the priesthood in 1676, and after the dispersion of the Solitaires in 1679 spent most of the remainder of his life on his estate at Tillemont near Paris. Here he died, 10th January 1698. His chief works are the laborious and solid *Mémoires pour servir à l'Histoire Ecclésiastique des Six Premiers Siècles* (16 vols. 1693–1712) and the *Histoire des Empereurs qui ont régné durant le Six Premiers Siècles de l'Église* (6 vols. 1691–1738).

Tillicoultry, a manufacturing town of Clackmannanshire, at the base of the Ochils and near the right bank of the Devon, 10 miles ENE. of Stirling and 4 NNE. of Alloa. Woollens have been manufactured here since the 16th century, and since 1824 also shawls and tartans, tweeds and silk fabrics. Pop. 3100.

Tillodonts. See EOCENE SYSTEM.

Tillotson, JOHN ROBERT, Archbishop of Canterbury, was born the son of a Puritan clothier, at Sowerby in Yorkshire, in October 1630. He studied at Clare Hall, Cambridge, graduated B.A. in 1650, and became a fellow the year after. The writings of Chillingworth influenced him early, not less the conversation of Cudworth, and others of his school. In 1656 he became tutor in the house of Edmund Prideaux, Attorney-general under the Protector. He is said to have received his orders from Sydserf, Bishop of Galloway, and at any rate he was a preacher by 1661, when we find him ranged among the Presbyterians at the Savoy Conference. He submitted at once to the Act of Uniformity (1662), in December of the same year declined Calamy's church of St Mary Aldermanbury, London; but in 1663 became rector of Keddington in Suffolk, the year after preacher at Lincoln's Inn, where his mild, evangelical, but *un*doctrinal morality was at first little relished—'Since Mr Tillotson came,' said the Benchers, 'Jesus Christ has not been preached among us.' That same year he married a niece of Oliver Cromwell, and became lecturer at St Lawrence's Church in the Jewry. In 1670 he became a prebendary, in 1672 dean, of Canterbury. Along with Burnet he attended Lord Russell on the scaffold (1683). In 1689 he was appointed Clerk of the Closet to King William and dean of St Paul's, and in April 1691 was raised to the see of Canterbury, vacant by the deposition of the Nonjuror Sancroft. He accepted this elevation with the greatest reluctance, nor could all the insults of the Nonjurors to the end of his life extort either complaint or retaliation from the meek and tolerant primate. He died of palsy, 22d November 1694. His *Posthumous Sermons,* edited by his chaplain, Dr Ralph Barker, filled 14 volumes (1694), and for them the booksellers gave the unwonted sum of 2500 guineas. A complete edition of his whole works, including 254 sermons, appeared in 3 vols. folio, 1707–12; with a good Life by Dr Thomas Birch, 1752; and an annotated selection of his sermons by G. W. Weldon (1886). The judgment of Tillotson's preaching by his contemporaries is thus summed up by Burnet: 'He was not only the best preacher of the age, but seemed to have brought preaching to perfection; his sermons were so well heard and liked, and so much read, that all the nation proposed him as a pattern, and studied to copy after him.' Dryden used to say that what talent he had for English prose was due to his familiarity with Tillotson, and Locke recommends him as a model of perspicuity and propriety in language.

Tilly, JOHANN TSERKLAES, COUNT OF, a famous general of the Thirty Years' War, was born in 1559, at the castle of Tilly in Brabant. Educated by the Jesuits, he learned the art of war in the Spanish service under Parma, next fought in Hungary against the Turks, and was appointed in 1610 by Duke Maximilian of Bavaria to reorganise his army. He was given the command of the Catholic army at the outbreak of the Thirty Years' War, and in conjunction with Duke Maximilian gained (8th November 1620) the battle of Prague, which dissipated the ambitious dreams of the Elector-Palatine. During the course of this war he separated, by able strategy, the armies of Mansfeld and of the Margrave of Baden, beat the latter at Wimpfen (6th May 1622), expelled Christian of Brunswick from the Palatinate, defeating him at Höchst (20th June 1622) and at the desperate struggle at Stadtlohn (6th August 1623). Created a count of the empire, he next defeated the king of Denmark at Lutter (27th August 1626), and in conjunction with Wallenstein compelled him to sign the shameful treaty of Lübeck (1629). Next year he succeeded Wallenstein as commander-in-chief of the imperial forces, and took by storm the town of Magdeburg (q.v.; 20th May 1631). The unheard-of atrocities which he allowed the Croats and Walloons of his army to perpetrate on this occasion have cast upon his reputation a foul stain not to be blotted out. From this time fortune deserted him, for his next opponent was the great Gustavus Adolphus, who completely routed him at Breitenfeld (17th September 1631); and, though in the following spring he obtained a slight success over the Swedish general Horn, the king speedily

drove him to retreat behind the Lech in Bavaria, and (5th April) forced the passage of the river right in his front, after a desperate conflict, in which Tilly received his death-wound. He was carried to Ingolstadt where he died, 20th April 1632. Tilly was small and meagre, with fierce eyes and a stern countenance, sober and continent, a despiser of luxury and wealth. His zealous support of the Catholic party was entirely founded upon fanatical zeal for the supremacy of a religion which he regarded with more than monkish devotion. See THIRTY YEARS' WAR.

Til-seed. See SESAME.

Tilsit, a town of the province of East Prussia, on the left bank of the Memel or Niemen, 79 miles NE. of Königsberg by rail, with some miscellaneous manufactures, and an active trade in timber, corn, hemp, flax, butter, &c. Here was signed, on an island in the river, the treaty of 1807 between Alexander I. of Russia and Napoleon, which marked the lowest depth of Prussia's humiliation, and took away (till 1815) half of her territory (see NAPOLEON). Pop. 51,000.

Timæus, Greek historian, was born about the middle of the 4th century B.C. in Sicily, and died there about a century later. For fifty years, however, he lived and wrote in Athens, his great work being a series of *Histories* on Italy, Sicily, Greece, &c. Polybius took him to task for excessive partiality, but Cicero lauded the breadth of his scholarship, and Plutarch and others resorted to his works.

Timaru', a port in the south island of New Zealand, 100 miles SW. of Christchurch. It is the centre of a fertile agricultural district producing wool, flour, and meat. Pop. 16,500.

Timber. *Nature of Timber.*—All species of timbers being derived from a living organism are cellular in structure, i.e. are composed of myriads of cell units, of which only the largest are visible to the naked eye. Woody tissues must, therefore, not be conceived as a homogeneous whole, even though at least some timbers present a somewhat uniform appearance throughout. The cells which constitute the tissues of a tree vary in type according to the particular service they render to the living organism. They perform, in fact, very highly specialised functions in the economy of the tree, and consequently show adaptations consonant with the work they are called upon to do. These cell units are frequently bulked under the term 'fibres,' but such a description is not sufficiently precise to convey an adequate idea of the elements of which the trunk of a tree is formed. Of the various units which are to be recognised in anything like a correct representation of the constitution of any piece of timber the following must be distinguished: (*a*) Parenchymatous cells; (*b*) tracheids; (*c*) fibres; and (*d*) vessels. As in a close examination of timber for diagnostic purposes familiarity with the minute structure is necessary, the reader is at the outset recommended to refer to the article WOOD for a description of the above-mentioned elements and of other structures of which note will have to be taken later on.

PHYSICAL CHARACTERISTICS. (*a*) *Weight.*—Notwithstanding the fact that all wood substance has a specific gravity of about 1·56, the weight per cubic foot of timbers varies within wide limits. The lightest of all weigh about 12 lb. per cubic foot or even less, while the heaviest species attain a weight of about 85 lb. The latter are so heavy that they readily sink in water, as indeed would all species were it not for the occlusion of air in their tissues. All degrees of weight between these limits are represented. It will be readily appreciated that the weight of a variety may impose a limitation on its utility. As examples of very light timbers may be mentioned Balsa (*Ochroma lagopus*) and *Erythrina;* and of very heavy, Lignum vitæ and *Hardwickia binata.*

(*b*) *Hardness.*—Timbers also vary much in hardness. Some are so hard and intractable that they are exceedingly difficult to work, and impose a severe test on all cutting implements. This must, of course, greatly restrict their general usefulness. Others again are so soft as only to be capable of limited application. Among the very hard timbers may be cited Lignum vitæ and some of the Ironwoods, such as *Mesua ferrea;* and among the very soft, *Cochlospermum Gossypium* and *Bombax malabaricum.*

(*c*) *Grain and Texture.*—The phenomenon of grain in timber is due to a lack of homogeneity, and has reference mainly to the direction and arrangement of the tissues and the width of the annual rings. Descriptions commonly applied to it are coarse, fine, curly, twisted, straight, spiral, &c. The term has acquired a special significance in the phrase silver grain, a name applied to the figuring produced in certain timbers by the prominence, on the radial surface, of the medullary rays. One has a good example in the Common Oak (*Quercus pedunculata*). Texture should refer specifically to the elements in so far as they affect the openness or closeness of the tissues.

(*d*) *Colour.*—Colour is one of the most helpful features in the identification of timbers; it also often adds much to their value for furniture and ornamental purposes. Among the very beautiful timbers may be mentioned Andaman Padauk (*Pterocarpus dalbergioides*) and Mahogany (*Swietenia Mahogani*). Instances of characteristically coloured timbers are Ebony (*Diospyros Ebenum*), black; *Mesua ferrea,* port-wine hue; Padauk, rich red; *Morus alba,* yellow. Certain timbers can be distinguished from others by the solubility of their colouring matter in common solvents. Apart from their specific hues certain timbers, e.g. Common Oak, Yew (*Taxus*), &c., show a very distinct difference of colour between the inner and outer annual rings (see WOOD). The inner or more central portion of the bole, commonly darker or more deeply coloured, is known as the duramen or heartwood, and the outer or lighter coloured, the alburnum or sapwood. The normal differences between the two areas are sometimes disturbed by the growth of a fungus in the tissues, as when the natural whitish colour of the alburnum in certain conifers assumes a blue colouration.

(*e*) *Lustre.*—Some timbers as, for example, Sycamore (*Acer Pseudoplatanus*) are highly lustrous, while others, such as Hornbeam (*Carpinus Betulus*) and Ebony are distinctly dull. Beech (*Fagus sylvatica*) and Plane (*Platanus*) may be regarded as intermediate.

(*f*) *Smell.*—The odours of timbers, like their other characteristics, differ considerably. Some, like Pencil Cedar (*Juniperus virginiana*), have a very pleasant smell. Others may be described as unpleasant or even offensive, and still others as irritating to the nasal organs.

HOW TO IDENTIFY TIMBERS.—On the assumption that the article WOOD has been perused for descriptions of the chief components of woody tissues and their other characteristics, we shall proceed to apply this and other information for diagnostic purposes. Recognising that there are some hundreds of species used in one form or another as timber, diagnostic considerations can here only be extended to a few with a view merely to indicating essential points and illustrating methods. All timber trees are divided into two great categories, namely: (1) Dicotyledonous,

deciduous, or broad-leaved trees, which are also frequently called hardwoods. The Oak, Horse-chestnut (*Æsculus Hippocastanum*), and Poplar (*Populus*) may be instanced. (2) Ever-green, needle-leaved, or coniferous trees, also known as softwoods. Among them are Fir (*Abies*), Spruce (*Picea*), Larch (*Larix*), and Yew (*Taxus*). As is so often the case, popular nomenclature is here very unsatisfactory. All trees of group (1) do not shed their leaves annually, and so are not deciduous, neither are they all hard. Nor are all trees of group (2) evergreen or cone-bearing or even soft. With this explanation convenience must justify the employment of terms in common use.

The two great groups are readily distinguished by the simple fact that in hardwoods true vessels are always present, while in softwoods they are invariably absent. Taking first the hardwoods, the following features should be noted in a macroscopic diagnostic study: (1) General colour, appearance, weight, hardness, lustre, smell, &c. (2) Presence or absence of visible duramen. (3) Width of the alburnum. (4) Presence or absence of annual rings. (5) Size, number, and distribution of the vessels—whether the vessels in the spring or early wood of each year are disposed in a ring, and how the vessels in the autumn wood are arranged, i.e. whether uniformly, radially, or tangentially, &c. (6) Breadth, number, appearance, depth, and arrangement of the medullary rays. Much information can be got by examining the tangential section. Here it will be seen that in certain species, e.g. *Pongamia*, the rays are always in definite tiers. In Mahogany they are frequently so arranged. In some species they swell perceptibly in crossing the limits of the annual rings. (7) Distribution and amount of parenchyma and prosenchyma. If individual elements are rarely distinguishable, these cells can often be differentiated in the mass, as they frequently constitute definite areas or tissues. Often, too, they have a definite relationship to the vessels, and occasionally they may be seen to alternate in tangential bands so as to give rise to 'false' rings, which must not be confused with annual rings; (8) Colour of pith and its form (round, star-like, &c.) in cross-section. In a few species, e.g. Walnut (*Juglans*), it is chambered. (9) Presence or otherwise of secretory cavities or ducts. While these features are capable of very wide application, they are not adequate for a detailed examination, in which case the use of the microscope is imperative.

As an illustration of how certain of the above characters may be used for diagnostic purposes, we may take a very simple example, based on Hartig's key, from among the commoner British timbers:

A. Vessels in the spring wood large.
  i. Vessels in the autumn wood arranged radially.
    (1) Some medullary rays broad—Oak.
    (2) All medullary rays fine—Spanish Chestnut (*Castanea vesca*).
  ii. Vessels in the autumn wood mostly evenly distributed—Ash (*Fraxinus*).
  iii. Vessels in the autumn wood in concentric wavy lines—Elm (*Ulmus*).
B. Vessels in the spring wood neither markedly larger nor more numerous than elsewhere.
  i. All vessels prominent—Walnut (*Juglans*).
  ii. All vessels scarcely visible.
    (1) Medullary rays numerous and broad—Plane.
    (2) Medullary rays of various widths—Beech, Hornbeam, Hazel (*Corylus*).
    (3) Broad medullary rays scarce or sometimes absent—Common Alder (*Alnus*).
    (4) All medullary rays fine but distinct—Sycamore, Lime (*Tilia*), Holly (*Ilex*).
    (5) Medullary rays not visible to the naked eye.
      (*a*) Hard Woods—Pear (*Pyrus communis*), Apple (*P. Malus*), Hawthorn (*Cratægus*), Birch (*Betula*).
      (*b*) Soft Woods—Horse-chestnut, Willows (*Salix*), Poplars.

How the help of the microscope may sometimes be requisitioned to distinguish timbers which are almost indistinguishable to the naked eye is well illustrated by the last two genera. *Salix* and *Populus* are most easily differentiated by the fact that in *Salix* the marginal cells of the rays are distinctly deeper than the median ones, while there is not a similar difference in the case of *Populus*.

It is to be noted that the group of characters which may be important for diagnostic purposes in any particular case will depend on the types of timbers to be examined and differentiated, and in the selection of the most appropriate of these to each group of timbers the student will find ample scope for ingenuity. So far as the diagnostic study of coniferous timbers can be prosecuted macroscopically, the points to note are: (1) Presence or absence of differentiated duramen. It is present in most conifers, but absent in *Abies* and *Picea*. (2) Colour of duramen. (3) Width of alburnum. (4) Presence or absence of resin ducts. They are present in *Pinus*, *Larix*, *Picea*, and *Pseudotsuga*, but normally absent in all other genera, except perhaps in the first annual ring of *Sequoia*. (5) How resinous the wood is and the colour of the resin. (6) Hardness, weight, and texture. (7) Distribution of knots. They are, according to the genus, either scattered (*Larix*) or in whorls (*Pinus*).

In the case of coniferous timbers microscopic examination is essential in the differentiation of most genera, and should be directed to ascertain: (1) Whether there are tracheids in the medullary rays, as in *Pinus*, &c., or not, as in normal *Sequoia*, &c. (2) The form, size, and number of the pits in the parenchymatous cells of the rays. They are very large in most Pines, and small in Larches, Cedars (*Cedrus*), &c. (3) Whether there is spiral thickening on the walls of the vertical or wood tracheids, as in *Taxus*, *Pseudotsuga*, &c., or not, as in *Abies*, *Sequoia*, &c. (4) What the size and distribution of the bordered pits in the vertical tracheids are. They are, for example, small and grouped in *Dammara* and *Araucaria*. (5) Whether there is any special marking on the torus of the bordered pits of the wood tracheids as in *Cedrus*, where it presents the appearance of a miniature circular saw, and suffices to distinguish this genus. (6) Whether vertical parenchymatous cells are present. (7) Whether there are resin ducts in the wood. (8) The distribution of resin and resin cells. (9) The depth and form of the medullary rays, i.e. whether they are multiseriate or several cells wide, or uniseriate.

Sources and Supplies of Timber.—Although it is difficult to estimate the amount of home-grown timber used for estate purposes, building, pitwood, &c., in the United Kingdom, it is relatively insignificant compared with the import trade. The extent of this overseas trade in timber is not generally realised, and though during the last few years the money value of imported timber has shown a progressive diminution, yet in 1926 its value reached the fabulous sum of close on £40,000,000. In the government publication, *Accounts relating to Trade and Navigation of the United Kingdom for each Month during the Year 1926*, particulars are given of the importations of timber into Great Britain, Northern Ireland, and the Isle of Man. In it Mahogany is classed by itself without any indication of the sources of supply being given, but its total amount was 4,275,562 cubic feet, and its value £1,259,131. So far as the source is specified, the chief supplies of the other timbers came from the following countries, arranged in decreasing order of quantities imported:

Hewn Hardwoods....U.S.A., Canada, Finland, British East Indies, Russia.

Hewn Softwoods	Russia, Finland, U.S.A., Sweden, Norway, Canada, Germany.
Sawn Hardwoods	U.S.A., Canada, British East Indies, Finland, Poland, Japan.
Sawn Softwoods	Finland, Sweden, Russia, Poland, Latvia, Canada, U.S.A., Norway, Germany.
Planed or Dressed	Sweden, Norway, Finland, U.S.A., Germany.
Pitwood	France, Finland, Sweden, Norway, Portugal.

The following were the total quantities of various classes imported during the year 1926, together with their total values:

	Cubic Feet.	Total Value.
Hardwoods (Hewn and Sawn)	31,054,194	£7,944,049
Softwoods (Hewn and Sawn)	253,492,235	22,961,463
Planed or Dressed	30,260,450	3,465,741
Pitwood	79,195,950	2,990,886
Other Descriptions	16,759,300	1,906,737

USES OF TIMBER.—It is questionable whether any material or natural product has been applied to the service of man so universally or for so many purposes as has wood. It was the fuel of primitive man, and early in his career he used it extensively in hunting and warfare. It is still very largely so used, though in a modified form. Modern man begins the day by using wood as fuel, and ends it, as likely as not, in a wooden bed. He sits on wooden chairs; his tables are manufactured from it, and his houses are largely or wholly built of it. A not inconsiderable proportion of ladies' footwear and a very appreciable amount of artificial silk is now manufactured from the same raw material. Paper is also made in large quantities from it. Ships, in great part, are made from it; and so it plays a large and indispensable part in world commerce. Carts, carriages, bodies of motor-cars, parts of machinery, tools, and various implements are derived wholly or in part from the same source. Much of the best in art has been enshrined in it, and nothing lends itself better for decorative purposes. It also contributes extensively to the lighter side of life, being equally indispensable to our games as to the more serious pursuits of life, and we need it for the manufacture of our hockey sticks, cricket bats, racquets, skittles, cues, &c. With such a formidable catalogue of uses, it would be impossible here to do more than touch the fringe of this aspect of the subject.

The particular characteristics of a species largely determine its special uses; and one may ask what some of the factors are, other than supply and cost, which determine the uses to which various woods or individual specimens are put. The following are a few:

(1) *Conditions of Growth.*—Soil, climate, denseness of the forest, and other conditions to a large extent affect the quality and the appearance of timbers. A slow-grown oak, or other broad-leaved timber with a pore-ring, is not so heavy as a wide-ringed specimen, nor so durable.

(2) *Colour.*—Colour is, of course, an exceedingly important consideration in relation to furniture manufacture and ornamental work. The particular hue of a species and the distribution of the colour have a great bearing on its utilisation.

(3) *Arrangement of Tissues.*—This is what largely determines the type of figuring in a board—a factor to be considered in many kinds of work.

(4) *Weight.*—This is a character of paramount importance in certain cases, such as aeroplane construction, where lightness must be combined with strength. The necessity for this combination for so many purposes has resulted in the manufacture of ply-wood for innumerable applications.

(5) *Toughness.*—For cogs of wheels, &c., toughness is an essential feature; it is found, for example, in hornbeam.

(6) *Elasticity.*—This quality is necessary for the handles of certain tools and for shafts of vehicles, and we get it in our native ash.

(7) *Position in a Piece of Furniture or other Work.*—It is clearly not so essential to use such high grade timber for parts which are concealed as for those which are exposed.

(8) *Burrs.*—Burrs on certain trees are highly prized by cabinet-makers.

(9) *Bird's-eye Figure.*—This arises from local, sharp depressions in the outline of the annual rings. In tangentially-sawn timbers and rotary veneers these produce a series of ringlets which to the imaginative mind suggest so many birds' eyes.

The following are the chief uses to which the principal indigenous and a few of the better known exotic timbers are put:

HARDWOODS.

American or Canary Whitewood (*Liriodendron Tulipifera*)—Veneer, panels, and general cabinet work.

Andaman Padauk (*Pterocarpus dalbergioides*)—Furniture, parquet floors, railway carriages, decorative work, panelling, &c.

Ash (*Fraxinus excelsior*)—Tool-handles, shafts, and other parts of vehicles, cabinet work, oars, horizontal bars, and other purposes for which elasticity is desirable, as in athletic appliances.

Beech (*Fagus sylvatica*)—Tool and implement handles, brush backs, boot heels, lasts, boot trees, piles, treads of stairs, parts of chairs.

Ebony (*Diospyros Ebenum*)—Turnery, cabinet work (often with ivory and other inlays), brush backs, &c.

Elm (*Ulmus* spp.)—Coffins, chairs, wheels, weather-boards, &c.

Greenheart (*Nectandra Rodioei*)—Piles, bridges, shipbuilding, dock gates, jetties, fishing-rods, &c.

Hornbeam (*Carpinus Betulus*)—Cogs, mallets, agricultural implements, and carriage-making.

Jarrah (*Eucalyptus marginata*)—Shipbuilding, piles, dock gates, furniture, panelling, buildings, paving blocks, telegraph poles, &c.

Lignum vitæ (*Guaiacum officinale*)—Pulley blocks, rollers, batons, bowls, croquet mallets, lining of axle cylinders, &c.

Mahogany (*Swietenia**)—Furniture, panelling, bank counters, decorative work, &c.

Oak, Common (*Quercus pedunculata*)—Shipbuilding, furniture, structural work, vehicles, wainscoting, fencing posts, &c.

Spanish Chestnut (*Castanea vesca*)—Structural work, fencing posts, piles, hop poles, &c.

Sycamore (*Acer Pseudoplatanus*)—Butter prints, rolling-pins, mangle rollers, bread platters, cabinet work, turnery, calico-mill rollers, &c.

Teak (*Tectona grandis*)—Shipbuilding, railway carriages, garden seats, gates, tops of chemical (laboratory) benches, &c.

Walnut (*Juglans regia*)—Gun stocks, aeroplane propellor blades, furniture, decorative work, veneer, &c.

SOFTWOODS.

Californian Redwood (*Sequoia sempervirens*)—Panelling, furniture, and various types of joinery.

Douglas Fir or Oregon Pine (*Pseudotsuga Douglasii*)—Masts, flagstaffs, structural work (including indoor fittings), benches, flooring, &c.

Kauri Pine (*Dammara* or *Agæthis australis*)—General joinery and decorative work.

Larch, Common (*Larix europæa*)—Gates, fencing material, sleepers, piles, pit-props, scaffold and wireless poles, &c.

Pitch Pine (*Pinus palustris* or *P. australis*)—Piles, panels, staircases, furniture, pews of churches, structural work, posts, masts, &c.

* Of the genus *Swietenia*, some five species are known whose timbers are indistinguishable. The product of several other genera is sold in commerce as mahogany.

Scots Pine (*Pinus sylvestris*)—Though indigenous, the chief supplies are imported from the Baltic under the name of Baltic Redwood or Yellow Deal. Match-boarding, flooring, and other building work, masts, pit-props, telegraph poles, fencing, railway sleepers, &c.

Spruce, Common or Norway (*Picea excelsa*)—Largely imported from North and Central Europe as White Deal or Baltic Whitewood. Paper pulp, scaffold poles, flooring, match-boarding, and other internal work, &c.

Weymouth or White Pine (*Pinus Strobus*)—Known in Britain also as Yellow Pine. Much used for interior work in buildings, decks and other flooring, matches, &c.

Sawing of Timber.—There are two fundamental directions in which timber is sawn for boards. It may be sawn either tangentially or more or less radially (see Diagram). Timber sawn in the former direction has been variously called plain-sawed, flat-grained, or bastard lumber, while timber sawn in the direction of the rays is described as radially-cut or quartered. In appearance, boards cut in these two directions respectively usually differ greatly. These differences are due to the heterogeneity of the wood structure. In the case of many conifers, especially those with a distinctly marked autumn wood, the appearance is enhanced by sawing tangentially, for in such a case the saw in passing repeatedly from one annual ring to another exposes a surface beautifully marked by an effective alternation of deeply-coloured, dense autumn wood with more open and less resinous spring wood. In many hardwoods, however, the radial section presents a more fascinating aspect, for where the rays are deep and prominent they often add much to the appearance of a board. Oak, e.g., has its beauty much enhanced by the exposure of its medullary rays or silver grain. The rays are beautiful, not merely because they are conspicuous, but also because they differ in colour from the surrounding tissue. For æsthetic reasons there should be a reasonable amount of silver grain showing in the exposed portions of oak furniture. Other factors, however, must be considered in the economic utilisation of a log. It is, e.g., obvious that radial sawing must entail a greater wastage in conversion. One other disadvantage of quartering is that knots when present are cut lengthwise, being 'spiked' rather than round as is the case in a tangential board.

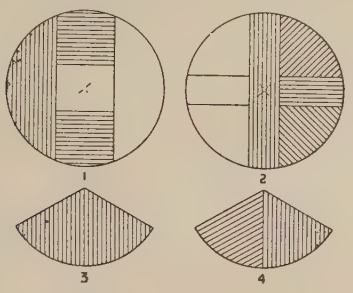


Diagram showing various methods of sawing timber: 1, tangential sawing; 2–4, quarter sawing.

Seasoning of Timber.—Seasoning of timber is practised to reduce the cost of handling and transport, to obviate shrinkage and warping after utilisation, to increase its strength, and to minimise danger and loss from the growth of fungi. Timber may be seasoned either

(1) *Naturally*, in which case it is simply stacked in the open or in a semi-open shed, so as to allow free access of air without the aid of artificial heat. In this way it loses a large amount of moisture, and it is thoroughly air-dried when under favourable conditions of seasoning it ceases to give off moisture.

(2) *Artificially*, when it is enclosed in a dryer for the application of artificial heat. The period of seasoning is thus shortened, and with proper precautions it is claimed that the results may be even more satisfactory than when the seasoning is effected by natural means. This method is now extensively employed. It has the further merit of allowing control of the conditions.

(3) By a combination of methods (1) and (2).

Messrs A. L. Howard and S. Fitzgerald, writing in 1920 on the subject of artificial seasoning, express themselves as follows: 'Relatively little artificial seasoning has formerly been effected in Great Britain, owing to general prejudice and the lack of urgent necessity. Impelling national need during the war caused the process to be then taken up scientifically, and the timber so treated was found to pass the most stringent tests. In the future, those timber merchants and timber users who continue to ignore this factor will be at a great disadvantage in the commercial field compared with those who in a vigorous and enlightened spirit embrace the most modern methods of seasoning their timber; while it must be remembered that competition will not be confined to this country, but will also include the progressive continental peoples.'

Rotting of Timber.—Decay of timber is entirely attributable to living agencies. If kept in the forest too long after felling, especially with the bark on, boring insects and saprophytic fungi may cause serious damage by reducing the value of the converted timber and restricting its uses. Nor is this the only danger to which timber may be subjected. If after conversion it be kept in carelessly-managed or infected yards, or be used in damp, unventilated places, there is grave danger of the development of fungi, which eat into the substance of the wood, destroy its tissues, and greatly reduce its value, or even render it entirely worthless and a danger to other stocks or wooden structures in its vicinity. An instance of such destruction is that due to dry rot, which is to be assigned to the fungus *Merulius lacrymans*. This is perhaps the most familiar example of a wood-destroying fungus, but there are numerous others.

In view of the danger and loss arising from this source it may be well briefly to mention the essential conditions for the growth and development of these disintegrating agencies. Four conditions must be satisfied. There must be a suitable temperature and a sufficiency of air, water, and food. If the temperature be too high or too low, then the fungus, if not killed, becomes dormant, and simply awaits a suitable opportunity for renewing its growth and extending its destruction. If air is completely excluded the fungus cannot thrive, but such a condition is only rarely attained, as when timber is completely immersed in water and has become water-logged or is buried sufficiently deep in clay soil. Similarly, if there be an inadequacy of water danger is eliminated. As to suitable food, even when the starch and other substances in the plant cells have been exhausted, there remain the woody tissues themselves, which provide the necessary pabulum for many wood-destroying organisms. To illustrate how the conditions specified operate, one may take the familiar example of the fencing-post. It is well known that such a post usually decays quickest at the junction of air and earth. Well above ground even after rain the post soon dries, and so resists decay. Below the ground it is kept more constantly wet, and air, especially in damp soil, is more effectively excluded. Just at the ground-level there is an abundance of both air

and water to meet the requirements of growth, and it is here, where all the conditions are most completely satisfied, that rotting most rapidly takes place. The practical bearing of these considerations in constructional work is important. There is little danger, e.g., to the general woodwork of a house and its furniture if the timber used is sound and has been sufficiently dried before use, so long as proper ventilation is ensured to prevent the accumulation of moisture. This need applies especially to flooring and such part of the woodwork as is in contact with the masonry. From the neglect of such elementary precautions dire results often ensue.

Preservation of Timber.—The preservation of timber by chemical agencies has been much extended in recent years. It has resulted not only in lengthening the life of higher grade timbers, but has also enabled inferior and less durable types to be used for purposes to which untreated they are regarded as unsuited. It has thus effected a great and much needed conservation of timber when available supplies are in many countries being rapidly exhausted. Among the early attempts at preserving timber may be mentioned painting, tarring, and carbonising or charring. Painting and tarring are effective for many purposes, assuming that the wood is properly seasoned at the time of the first application, that the paint is applied at frequent intervals, and that care is taken to seal joints, &c., so as to prevent the reabsorption of moisture and accessibility of damp air. If the wood be not dry, painting and tarring retard the evaporation of moisture. According to recent American tests, charring of poles and posts has proved ineffective.

Other methods employed may be classified as follows, according to the nature of substances used :

A. *Inorganic Substances.*—These are water-soluble.

(1) *Kyanising*, by which is meant the treatment of wood with mercuric chloride (corrosive sublimate). This substance, while very toxic to micro-organisms, has the serious drawback of being very poisonous also to animal life and dangerous to handle. It, moreover, attacks iron.

(2) *Burnettising.* Here zinc chloride is substituted for corrosive sublimate. In America this is the most commonly used of the inorganic substances. Its effect on iron is less than that of mercuric chloride.

(3) Other processes involve the use of

(*a*) *Copper sulphate* (bluestone). It attacks iron.

(*b*) *Sodium fluoride*, which is apparently effective but costly.

B. *Organic Substances.*

(1) *Powellising*, which is the name given to the process of boiling timber in a saccharine solution without pressure and drying at a high temperature. It is seemingly effective.

(2) *Creosoting*, which involves the use of products derived from the distillation of tar from various sources—coal, wood, and petroleum. Of the three types, coal-tar creosote is the one most generally used.

The simplest practice in preserving wood entails steeping or coating only, but other processes involve more elaborate procedure and various practical expedients to ensure the proper penetration of the preservative.

Timbrel (Spanish *tamburil*), a small musical instrument, in use in ancient times, notably by Miriam after the passage of the Red Sea, which was carried in the hand, and was apparently quite similar to the modern Tambourine (q.v.).

Timbuktu (native *Tumbutu*, Arab. *Timbukhtu*, French *Tombouctou*), a famous city of Sudan, on the southern edge of the Sahara, lies about 8 miles north of the main stream of the Niger. It stands only a few feet above the level of the river, is about 3 miles in circumference, and at present without walls, though in former times it covered a much greater area, and was defended by walls. The houses are mainly one-story mud-hovels, but one of the three chief mosques is a large and imposing building, dating from 1325. The place stands on an important trade route between the interior and the west and south ; and its importance has increased through the gradual extension of French influence hither (see Senegambia). Articles of trade are gold-dust, salt, kola-nuts, ivory, gums, ostrich-feathers, dates, and tobacco, exchanged for Manchester goods, mirrors, knives, tea, coral, &c. The town stands on the borders of various tribes and kingdoms—Sonrhai, Berbers, Tuaregs, Fulahs, Mandingoes, &c. ; and amongst the 5000 inhabitants of the place all these are represented, with Arabs, Arabised Africans, and Jews. Timbuktu was apparently founded in the 11th century, and first became known to Europeans in the 14th (Ibn Batuta was there about 1350) ; it had been visited by but six or seven Europeans, including A. G. Laing in 1826, Barth in 1853, Lenz in 1880, when it was occupied by the French in 1894. It has been besung by Tennyson and Thackeray. See Sahara.

Time. The earth's axial rotation is the phenomenon by which time is measured everywhere on the earth's surface (see Day). Experiment and observation show that, if we assume the earth to rotate uniformly, there are many other phenomena which are as accurately isochronous in their periodicity. That is to say they pass again and again through all their phases in exactly the same interval of time as measured in terms of the earth's time of rotation. In the pendulum of a clock and the balance-wheel of a watch we have such isochronism very approximately realised (see Horology). A little consideration will convince us that the measurement of time is really a comparison of periodic sequences. We cannot conceive any other mode of marking off time intervals than by some kind of motion of a periodic character. Our practical unit of time is essentially terrestrial. We may, however, measure time in terms of a unit which could be as easily defined anywhere in known space as on the surface of our earth. The periodic time of a particular ray of light emitted by a universally distributed substance like hydrogen would be such a cosmic unit.

It has been long the custom among civilised races to divide the day into twenty-four hours, or rather into two sets of twelve hours, mean solar time (see Day). Twelve o'clock noon corresponds to the meridian passage of the *mean* sun ; and each day begins at twelve midnight. Now as we pass westwards the instant at which the sun crosses the meridian occurs later and later, as measured on a clock keeping, say, Greenwich time. That is, the noons at two places not situated on the same longitude line occur at different instants. Thus the local time of Glasgow is 17 min. 10 sec. later than that of Greenwich. Till the end of the first half of the 19th century local time was largely used in Great Britain. When railways were introduced some places kept 'railway,' i.e. Greenwich, time and others local time. For instance, in 1859 a defendant in a lawsuit at Dorchester arrived at the court at the time fixed for its opening, and

found the case given against him because the court had used Greenwich time while he had used local time. He was granted a new trial, the Court of Exchequer holding that local time was legal time. It was not till 1880 that the Definition of Time Act was passed making Greenwich time the legal time for Great Britain.

After transcontinental railways had been constructed in Canada and the United States it became necessary to co-ordinate the time kept in North America. Time differing by an exact number of hours from Greenwich time was introduced, the whole country being divided into zones 15° in width with the meridians of 75°, 90°, 105°, 120°, &c., in the middle of the zones—the time kept in the several zones differing exactly 5 h., 6 h., 7 h., 8 h., &c., from that at Greenwich. The adoption of zone time throughout the world was largely advanced by an international conference at Washington in 1884 which, with some dissentients, recommended the adoption of Greenwich as Prime Meridian. At a conference held in Paris in 1912 the use of Greenwich time was recommended for time signals sent by wireless telegraphy. At the present time, with very few exceptions, time differing by an exact number of hours or half-hours from Greenwich is used by all civilised countries.

For some purposes it is convenient to count the hours of the day from 0 to 24 and not from 12 to 12 twice. In this case the day begins at midnight, and 16 h. (e.g.) denotes 4 o'clock in the afternoon. Astronomers had for long used a 24-hour day beginning at noon, but in 1925 changed the beginning of their day to midnight so as to be in conformity with civil practice.

Time is earlier or later than Greenwich according as the locality is east or west of Greenwich. Thus places lying close together but on different sides of the longitude line of 180° differ nominally by a whole day in time. Sunday at the one place occurs simultaneously with Monday at the other. A vessel sailing eastwards across the Pacific has two consecutive days of the same name as it crosses the critical meridian, or in other words has one day of nearly 48 hours' length. On the other hand, a vessel sailing westwards in the same longitude drops a day. Until a few years ago the Philippine Islanders held their Sunday on the day which was Monday to the inhabitants of Borneo. This arose from the historic fact that the Philippines were discovered by the Spanish voyagers coming from the east round Cape Horn; whereas Borneo was discovered by the Portuguese coming from the west. The matter is put most simply thus: To the eastward-bound traveller sunrises come at shorter intervals than to the stationary observer, while to the westward-bound traveller they come at longer intervals. Thus after one complete circuit the former traveller has experienced one sunrise more, and the latter one sunrise less, than has the stationary observer in the same lapse of time.

When it is twelve o'clock noon, Greenwich mean time, the hour (local time) at various important places on the globe is as follows:

Auckland, N.Z.	11 h.	39 m.	P.M.	New York	7 h.	4 m.	A.M.
Bombay	4	51	P.M.	Paris	0	9	P.M.
Calcutta	5	53	P.M.	Peking	7	46	P.M.
Cape Town	1	14	P.M.	Quebec	7	15	A.M.
Dublin	11	35	A.M.	St Petersburg	2	1	P.M.
Edinburgh	11	47	A.M.	San Francisco	4	23	A.M.
Melbourne	9	40	P.M.	Sydney	10	5	P.M.

For sidereal time, see DAY; see also the articles on Astronomy, Calendar, Chronology, Clepsydra, Dial, Hour, Hour-glass, Latitude and Longitude, Month, Period, Seasons, Year. For philosophical theories of time, see PSYCHOLOGY, p. 449, and RELATIVITY, p. 612.

Times, THE, is a London daily paper, frequently spoken of as the leading journal of the world. It was established in 1788 (see NEWSPAPERS). The founder, John Walter (1739–1812), was not a printer or journalist by profession, but an underwriter at Lloyd's who had made a fortune and lost it in consequence of the capture by a French squadron of a fleet of merchantmen on which he had taken a large risk. In 1803 the management of the paper was transferred to John Walter (1784–1847), the son of the founder, a man of exceptional talent, energy, and enterprise. He refused to accept the foreign news offered him by the government, and organised a system by which intelligence from abroad was more correctly reported and more rapidly transmitted to London than it ever previously had been. The capitulation of Flushing, the victory of Waterloo, and many other important events were made known to the English public before the arrival of government despatches. The *Times* earned a high reputation for independence by the opposition it offered to the ministry of Pitt. Walter, after overcoming difficulties which would have disheartened most men, succeeded in 1814 in printing the *Times* by steam, a most important event in the history of PRINTING (q.v., p. 389). In 1816 Thomas Barnes (1785–1841) became editor. As a leader-writer he was assisted by John Sterling, 'the thunderer.' Barnes's successor was John T. Delane (q.v., 1817–79), then a young man fresh from Oxford. The new editor wrote no articles, but he read all important matter printed for publication; and one of his chief tasks during the thirty-six years of his editorship was to make the leaders of able specialists reflect the ideas, tone, and language of the best London society. It was he chiefly who obtained for the *Times* leaders the reputation of being models of English style. In 1847 John Walter (1818–94), third of the name, for twelve years member for Nottingham, and then from 1859 till 1885 for Berks, succeeded his father as proprietor. He inherited the enterprising spirit of his family. In his time the railway and electric telegraph revolutionised newspaper management, and no journal so rapidly and successfully adapted itself to the new conditions as the *Times*. The most prominent assistant of Walter in this work was John Macdonald (1822–89), for many years manager of the paper. He combined literary ability, business experience, and great administrative capacity with high inventive talent as a mechanical engineer. Under his able guidance, and at enormous expense, experiments were conducted which brought to perfection in 1860 the art of printing from stereotypes, and in 1866 'the Walter press' (see PRINTING, p. 390). In many ways the *Times* has won the confidence of the mercantile public. In 1841 it was the means of detecting a conspiracy by which London bankers would have been defrauded to the amount of one million sterling, but it had in consequence to defend an action at law. The merchants and bankers of London raised a sum to pay the costs, which, on their offer being declined, was employed to found two scholarships at Oxford and Cambridge. A notable event in the history of the paper was the 'Parnellism and Crime' articles (see PARNELL, p. 778). Delane was succeeded as editor by Thomas Chenery (1826–84; in 1868 appointed professor of Arabic at Oxford), and he on his death by Mr George Earle Buckle (b. 1854). Mr Buckle resigned in 1912, and Mr Geoffrey Robinson, afterwards Dawson (b. 1874), was editor till 1919, and again from 1923, Mr Wickham Steed (b. 1871) having been editor in the interval. A weekly issue was begun in 1877; *Law Reports* in 1884 and a *Literary Supplement* in 1897 (modified in 1901). There are several other supplements and indexes. But since 1895 the *Times* 'has invaded several new fields of enterprise' and issued

atlases, a gazetteer, a reprint of the 9th edition of the *Encyclopædia Britannica* (with supplement), and war histories; besides founding a book club and maintaining a vehement controversy (1905-6) with publishers and booksellers about the early sale of second-hand library volumes. In 1906 the proprietors formed themselves into a limited liability company. See NEWSPAPERS.

Time-Tables. See BRADSHAW (GEORGE).

Timgad. See THAMUGAS.

Timoleon, born of a noble family of Corinth at the end of the 5th or early in the 4th century B.C., was in 344 sent to Sicily at the prayer of the Greek cities there to save their liberties and repel the Carthaginians. He landed at Tauromenium, overthrew Hicetas, tyrant of Leontini, who was striving to drive Dionysius out of Syracuse, and by 343 had possession of Syracuse itself. Hicetas now induced the Carthaginians to send a huge army into the island, but Timoleon marched to meet them with 12,000 men, and routed them though seven to one on the river Crimissus (339), the gods themselves showing him signal favour by driving a blinding hail-storm right into the faces of the enemy. The Carthaginians were now fain to make a treaty by which they confined themselves to the west of the Halycus. He next drove out all the tyrants, and restored their freedom to the Greek cities of Sicily, then settled quietly as a private citizen in Syracuse, enjoying the love and admiration of the whole Greek world until his death in 337. Holm, the German historian, calls Timoleon the Garibaldi of antiquity; and the comparison does justice to his daring, his honesty of purpose, and his force of character, hardly to his wisdom and political foresight. His story was written by two contemporary writers, Timæus and Theopompus, who supplied the materials alike to the extant works of Diodorus Siculus and Plutarch. The latter's life is one of his masterpieces. An excellent edition is that by Dr Holden (Camb. 1889).

Timon, the misanthrope, was a native of Athens, and a contemporary of Socrates. The little that is known concerning him is learned chiefly from Aristophanes and the other comic writers who attacked him. Disgusted with mankind on account of the ingratitude of his early friends and companions, he lived a life of almost total seclusion from society, his only visitor being Alcibiades. Lucian made him the subject of a dialogue; but his name survives best in Shakespeare's play, the basis of which was the version of the story given in Painter's *Palace of Pleasure*.

This Timon must be distinguished from Timon the *Sillographer*, a Greek poet and philosopher, who was a scholar of Pyrrho, flourished about 280 B.C., lectured at Chalcedon, and spent his latest years at Athens. There are extant some fragments of his *Silloi*, a series of sarcastic hexameters upon Greek philosophers.

Timor, the most important of the chain of islands that stretches eastward from Java, has a length of 300 miles, an area of 12,264 sq. m. A chain of wood-clad mountains runs throughout its entire length; one peak, Allas, near the south coast, being 11,500 feet in height. It is less volcanic than its smaller neighbours of the Sunda group, but it contains some quiescent or extinct volcanoes. Magnetic iron, porphyry, gold, copper, and sulphur are found. Otherwise the natural wealth of the island is not great, the comparatively dry climate producing a much less luxuriant vegetation than in Java. The exports are coffee, copra, maize, sandalwood, wax, tortoiseshell, and trepang. Separated from the Australasian region by the Arafura sea, the island shows few Australian types amongst its fauna and flora, which resemble those of Java, Celebes, and the Moluccas. The population is mainly Papuan, mixed with Malay and other elements. The smaller western portion belongs to the Dutch, with its capital at Kupang; the eastern part with a north-western exclave is Portuguese, capital Deli or Dilli; but native chiefs really govern the island.

Timor-Laut, or TENIMBER, a group of three islands, east of Timor, extending about 100 miles in length, and 2263 sq. m. in area. Unlike Timor, these islands are mainly coralline and correspondingly low-lying, though there is one extinct volcano 2000 feet high. Fauna and flora partake of Malay and Australasian characters. The natives are of Papuan stock. The islands belong to the Dutch residency of Amboyna.

Timotheus, Athenian general and soldier of fortune, son of Conon, held frequent commands (378-356 B.C.) in various wars of Athens against Sparta, Thebes, &c. He died at Chalcis in 354.

Timotheus OF MILETUS (*c.* 446-357 B.C.), Greek poet, known from Plutarch to have written *The Persians* for performance with the lyre. A papyrus dating from *c.* 350 B.C. (the oldest Greek MS. extant) was found at Abusir. This fragment of 320 lines of dithyrambic poetry was edited by Wilamowitz-Möllendorff (1903).

Timothy and Titus, THE EPISTLES TO. The two epistles to Timothy and the epistle to Titus are generally known as 'The Pastorals,' because they contain advice on the discharge of the pastoral office, the work of the ministry, and the management of the Church.

These epistles are ascribed by tradition to St Paul, but modern criticism since the time of Schleiermacher has called this theory into question. There are many grounds upon which doubt has been cast on the Pauline authorship. (1) The external evidence for the pastorals is weaker than in the case of the other Pauline epistles. We have no testimony to the Pauline authorship before 170. They are omitted by Marcion from his canon of the New Testament, and 1 and 2 Timothy were rejected by Tatian. Marcion and Tatian were, however, heretics, and their judgment may have been affected by their own theories. (2) The linguistic phenomena of the epistles seem to conflict with the Pauline authorship. The epistles contain a very much larger number of *hapax legomena*, i.e. words not found elsewhere in the New Testament, than the other writings of St Paul. No less than 171 words out of a total of 897 are peculiar to the pastoral epistles. More important still is the variation in the construction of sentences. The favourite Pauline connecting particles are almost entirely absent from these epistles, a fact which Marcus Dods regards as 'staggering.' The style and vocabulary of the epistles have much more in common with the patristic writers of the 2d century than with the accepted Pauline epistles. Evidence such as this cannot be lightly set on one side. (3) The historical situation implied in the pastorals cannot be fitted into the scheme of Paul's life as it is sketched in Acts. The epistle to Titus, for instance, records a visit of Paul to Crete, for which there is absolutely no room in the narrative of Acts. The only possible theory upon which the Pauline authorship can be maintained is the supposition that Paul was released after his first imprisonment at Rome, that he went upon further missionary expeditions, and that at the time when the pastorals were written he was in prison at Rome for the second time. There is some amount of support for this hypothesis in the statements of Clement of Rome, the Muratorian Fragment, Chrysostom, and Jerome,

but the evidence is by no means decisive. (4) The theological outlook of the epistles is different from that which we find in the accepted epistles of St Paul. As Sabatier says: 'With the Epistle to the Philippians the living progress ceases; with the pastoral letters the conservative tradition begins. Paul's doctrine is there; but the soul which sustained and vivified it appears already to have left it. . . . We have reached a point of arrest.' 'The writer of the Pastorals,' says Moffatt, 'presents the nucleus of the creed in technical, crystallised phrases, partly rhythmical, partly stereotyped in prose aphorisms, and the outcome is a piety nourished on "good works," with conceptions of reward, a good conscience, and reputation which are stated with more emphasis than Paul would have allowed' (*Introduction to the New Testament*, p. 411). Faith, for instance, is very often used in the objective sense of the *fides quæ creditur*, and refers to the object of belief or creed. (5) The references to the heresy attacked in the pastorals seems to point to a movement which belongs to the 2d century rather than the 1st. The writer, for instance, describes it as 'gnosis falsely so-called' (1 Tim. vi. 20), and alludes to its 'fables and endless genealogies,' a phrase which very aptly describes the later Gnostic systems. Moreover, the polemical method of the author of the pastorals is, as McGiffert has shown, different from that of Paul. 'Instead of demonstrating the falseness of the positions taken up by the heretics, he simply denounces them. . . . The spirit that actuates the pastorals is not the spirit of Paul, but the spirit of 2 John and Polycarp.' (6) The organisation of the Church, implied in these epistles, bears the mark of a later date than the lifetime of the apostle Paul. The Church is conceived not so much as 'the body of Christ,' as in the accepted Pauline epistles, but rather as 'the pillar and ground of the faith' and the guardian of sound doctrine. Great stress is laid upon the appointment of a properly authorised ministry. Elaborate directions are given as to the qualifications necessary in bishops or elders and deacons. It must be admitted, of course, that the organisation falls short of the Ignatian recognition of the 'three orders' of the Christian ministry; but still the epistles leave upon the mind of the reader the feeling that, in the words of Moffatt, 'the unwonted attention paid to the official organisation of the Church marks a development from that freer use of spiritual gifts by the members which Paul never ignored.

Each of these arguments, taken by itself, can be met, or, at any rate, can be proved to be too weak to carry with it the *onus probandi*—but the cumulative effect of the arguments taken as a whole seems to point decisively against the Pauline authorship, though it must be admitted that the verdict of modern scholarship is not unanimous, and that even so advanced a New Testament critic as Kirsopp Lake is still inclined to admit the possibility that these epistles came from the hand of St Paul. What seems to be the most probable solution of the problem is this: In their present form the pastoral epistles are the work of a 2d century writer, who was very anxious to conserve the orthodox faith of the Church against heresy, and to guard its ministry against corruption and deterioration. He used as a basis certain genuine notes of Paul, written during the course of his missionary travels. These notes are embodied in Titus, iii. 12–14; 2 Tim. iv. 9–12, 14–17, 20–21. Probably also the pastorals included a farewell letter written by Paul, fragments of which are found in 2 Tim. i. 1–5, 16–18, and possibly in some further verses in chapters ii., iii., and iv. The writer worked up this genuine Pauline material, and added to it the passages in which he urged the Church of his own day to be faithful to the teaching of the great apostle, and to keep itself free from the taint of heresy.

The best modern discussion of the problem of the pastorals is to be found in H. J. Holtzmann, *Pastoralbriefe kritisch u. exegetisch behandelt* (1880); Bertrand, *Essai critique sur l'authenticité des Ep. Past.* (1888); Findlay, appendix to the English translation of Sabatier's *The Apostle Paul* (1899); J. D. James, *Authorship and Genuineness of the Pastoral Epistles* (1906); P. N. Harrison, *The Problem of the Pastoral Epistles* (1921). See also the discussion in the New Testament introductions of Moffatt, Peake, Jülicher, Salmon, Holtzmann, Weiss, &c.; Shaw, *The Epistles of St Paul;* K. Lake, *The Later Epistles of St Paul;* books on the apostolic age by McGiffert, Pfleiderer, Weizsäcker, Bartlet, Wernle, &c. The best commentaries are by Von Soden, B. Weiss, Dibelius, Wohlenberg, Bernard, White.

Timothy Grass, the name commonly given to *Phleum pratense*, a grass much valued for feeding cattle. It first received the name Timothy Grass in America, from the name of a person who did much to promote its cultivation there. Along with the other species of the genus, it often receives also the English name of Cat's-tail Grass or Meadow Cat's-tail. The genus Phleum is distinguished by a panicle so compact as to resemble a close spike, single-flowered spikelets, with two nearly equal acuminate or almost awned glumes, two awnless paleæ, and the seed free. The species are mostly natives of Europe; a number of them are British, but the Timothy Grass alone is of any economical value. It varies very much in size according to soil and situation, succeeding best in moist, rich soils. It is very extensively cultivated both in Britain and in America, either alone or in mixture with clover and other grasses, both for pasture and for hay. It has strong culms, attaining a height of 4 to 5 feet, but is tender and nutritious, and much relished by cattle. It is perennial, but springs up rapidly, even in the year in which it is sown. Its spike-like panicle, from the form of which the name Cat's-tail has been given, is cylindrical, and often of several inches in length. The seed is very small. *Phleum nodosum* is a very similar species, perhaps a mere variety, with the lower part of the culm prostrate and swollen into knots or bulbs, the spike much smaller than in *P. pratense*. It is a very inferior grass, and is found only on dry soils.

Timothy Grass (*Phleum pratense*).

Timur. See TAMERLANE.

Tin (sym. Sn; atom. number, 50; atom. wt. 118·7; sp. gr. 7·3). Either tin itself or an ore of it must have been known from a very early time, as all ancient bronze objects contain a certain proportion of this metal (see BRONZE, and METALLURGY). Ingots of metallic tin and articles made of it have been found in several of the Lake-dwellings (q.v.) discovered on the continent of Europe. It was therefore smelted more than 2000 years ago. Pliny refers to Cornish tin, and the metal is known to have been taken to Italy through Gaul after the Roman conquest of Britain. See also CASSITERIDES.

Tin has a silvery-white colour with a faint yellow tinge, and objects made of it have a brilliant

lustre when new or newly cleaned. It does not tarnish readily. When melted and slowly cooled it is obtained in crystals of considerable size. A bar of the metal with a cross section of say a quarter of an inch in area is easily bent, and during the bending emits a crackling sound due to the crushing together of its crystalline particles. Tin is of greater hardness than lead, but it is softer than gold. It is very malleable, and can be beaten into foil as thin as $\frac{1}{1000}$ of an inch. Its tenacity is not great, a wire of the metal $\frac{1}{12}$ of an inch thick breaking with a weight of 56 lb. At the temperature of about 442° F. (228° C.) it becomes brittle enough to be reduced to powder by hammering. At St Petersburg a bar of the metal has been known to break up into small granular particles during a very low winter temperature. The same result may be obtained by lowering its temperature artificially to – 39° C.; at least it is very brittle at this temperature. Tin conducts heat and electricity moderately well. Its melting-point is 455° F. (235° C.), being considerably under that of lead. It is volatile, but only at a very high temperature. Among common metals it is least acted on by air and water, hence its utility for a great many purposes. With the exception of nitric, no acid attacks tin vigorously unless with the aid of heat.

There are two oxides of tin—viz. stannous oxide and stannic oxide, with corresponding series of salts. *Protoxide*, *monoxide*, or *stannous oxide*, SnO, is prepared by first adding to dichloride of tin a solution of carbonate of soda. The white precipitate produced is the hydrated oxide, which absorbs oxygen from the air; but when heated to redness in a current of carbonic acid, or dried in a stream of this gas in the absence of air, anhydrous stannous oxide is obtained as a black powder. The hydrated oxide dissolves readily in acids, but these act more slowly on the anhydrous oxide.

Dioxide, *binoxide*, or *stannic oxide*, SnO_2, forms on the surface of tin kept at a heat above its melting-point with access of air. This is removed as it forms, and again heated to completely oxidise any of the finely divided tin mixed with it. Stannic oxide is also produced when tin is acted on by nitric acid. It is this oxide of tin which, when finely ground, forms the hard white material known as Putty Powder (q.v.), and used for polishing hard stones and other bodies. It also enters into the composition of one kind of opaque white glass. Stannic oxide occurs in nature as the mineral cassiterite, the ordinary ore of tin.

Hydrated stannic oxide or *stannic acid*, H_2SnO_3, is obtained by adding carbonate of lime to tetrachloride of tin; also by adding an acid to stannate of potash or soda. It is a white gelatinous substance, acting as a base by combining with acids, as in tetrachloride of tin, or as an acid combining with bases to form salts, stannate of soda (sodium stannate), Na_2SnO_3, for example. But there is another state in which this acid occurs with quite different properties, when it is termed *metastannic acid*. If tin is placed in nitric acid of about 1·3 sp. gr., it is rapidly converted into a white crystalline powder having the same composition as stannic acid, but represented by the formula of this acid multiplied by five to account for its salts having only $\frac{1}{5}$ the quantity of base; thus, metastannate of soda is $H_2Na_2Sn_5O_{15}$. Metastannic acid is insoluble in all ordinary acids (except undiluted sulphuric acid), but it is readily soluble in alkalies, and the salts thus formed are converted into stannates by heating with excess of the base. The stannate of soda is used in calico-printing.

Sulphides of tin.—The monosulphide of tin, or stannous sulphide, SnS, is black, and stannic sulphide, SnS_2, yellow, the latter being soluble in sulphide of ammonium. Under the name of *mosaic gold* stannic sulphide is used as a bronze powder for bronzing articles made of plaster of Paris, wood, &c. There is a native sulphide of tin and copper.

Dichloride of tin or *stannous chloride*, $SnCl_2$, is obtained by boiling the granulated metal with moderately strong hydrochloric acid. It crystallises with two molecules of water. A solution of this salt, unless made slightly acid, soon shows a slimy whitish deposit by which it is easily recognised. It is a powerful deoxidising agent, persalts of iron being converted into protosalts when it is added to their solutions, and with other salts, such as those of mercury, causing a deposit of the metal. It is used as a test for gold in solution, giving a purple colour.

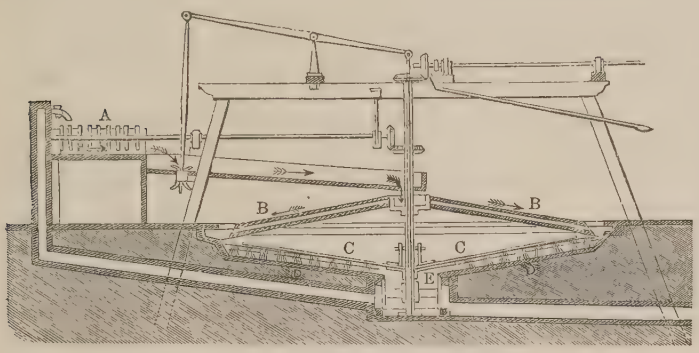
Tetrachloride of tin or *stannic chloride*, $SnCl_4$. This salt is formed when chlorine gas is passed over melted tin. It is also got as an anhydrous volatile liquid when powdered tin is distilled along with corrosive sublimate. It fumes when it meets the air, and has long been known as *fuming liquor of Libavius*. A more or less pure salt of this kind is used by dyers, made by dissolving tin in a mixture of hydrochloric and nitric acids. The chlorides of tin, like the stannate of soda, are used as mordants in dyeing. All the salts of tin give a bead of the metal when heated on charcoal in the inner blowpipe flame.

Ore and Smelting.—Tinstone or *cassiterite*, which is the binoxide of tin (often found in a nearly pure state), is the chief ore of the metal. Nearly all the tin of commerce is obtained from it. This mineral is usually of a dark-brown or blackish colour, but it is sometimes yellowish brown or gray. Its specific gravity is high—viz. from 6·3 to 7·1—and it is also very hard. It is found crystallised in quadrangular prisms, terminated by four-sided pyramids, and in more complex forms; and when pure consists of tin 78 and oxygen 22. Tinstone occurs in veins or lodes in granite or granitic rocks, gneiss, clay-slate, and mica-slate.

Wood-tin or *fibrous tin* is a fibrous form of cassiterite occurring in globular, botryoidal, or wedge-shaped fragments, usually of a small size. In colour and structure it has some resemblance to dry wood. *Stream tin* is again the same mineral found in the alluvial debris forming the beds or sides of streams. It has in course of time become separated by the disintegration of the veinstone, and is washed out of the gravel or debris. Cornwall was famous to the ancients for its stream tin, and even to-day a trifling output is obtained from the almost exhausted Cornish alluvium.

The world's normal annual output of the metal is about 125,000 tons, of which the British Empire produces one-half. The main source of tin is the alluvial workings of the Federated Malay States. These workings, which are chiefly in the hands of Chinese, are wrought partly underground and partly as quarries. In the quarries the application of powerful jets of water to break down the gravel (*hydraulic mining*; see under GOLD) is not uncommon. The second producer is Bolivia, where the ore comes principally from veins in the districts of La Paz, Oruro, Potosí and Chorolque. Two islands of the Dutch East Indies, Banka and Billeton, yield important quantities of tin; the diggings are entirely alluvial. Tin is widely distributed in Australia, and all six states produce the metal; the yield is partly from alluvial workings and partly from veins; the largest tin mine in Australia is the Mt. Bischoff mine, Tasmania. The United States, so rich in almost every other important metal, is singularly poor in tin, the annual yield being insignificant. Cornwall still remains an important producer. The veins, which are everywhere associated with granite, are numerous, and in many cases copper is yielded from the upper parts of a vein and tin from the deeper portions.

Tin ore from the mine is subjected to a complicated series of dressing operations. The tinstone of Cornwall especially is associated with a large number of other minerals, of which the chief are wolfram and iron, copper and arsenical pyrites. The ore, being in a very fine state of division, has to be thoroughly pulverised as a preliminary to the process of cleaning and separation which is termed *dressing*. Crushing is done by breakers, followed by stamps. The crude pulverised ore, borne by a plentiful current of water, is then fed to some form of *concentrator* (of which there are many types)



Borlase's Concave Buddle—vertical section :

A, box with agitator : the ore is fed here ; B, revolving spouts for distributing the ore at circular ledge ; C, arms with sweeps ; D, floor on which the washed ore settles ; E, well into which waste and slime falls.

by means of which a separation of the worthless material and of the valuable ingredients, one from another, is effected by virtue of their differences of density. The simplest concentrator is the rack-frame, which consists of a plane table set on a slope. The *pulp* (crude ore with water) is fed at the highest part of the frame, and runs down it. The heaviest minerals (e.g. tin-stone and wolfram) settle near the top, and less heavy minerals on the lower parts of the table, while the light worthless *tailings* pass off the table at the bottom. Arrangements are provided automatically to remove the different deposits from the frame at brief intervals. The deposits so obtained have often to be retreated several times on different appliances before they are sufficiently clean. Another concentrator, applied to rather finer material, is the *buddle*, of which one form is here illustrated. The pulp is fed, by the ducts *B*, all round the circumference of the buddle ; the pulp then flows down the conical surface *D*, towards the centre. The heavy minerals settle on the surface, but the waste flushes into *E*, whence it is led away. The sweeps hanging from the revolving arms, *C*, gently brush the surface, prevent it forming into *channels*, and agitate the topmost particles resting thereon. From time to time the buddle is stopped and allowed to dry, when the deposits which have settled upon it can be removed with spades.

Other tables, in which the bed revolves instead of being stationary, and from which the different products are discharged continuously, have been evolved as improvements upon the buddle, and are much used in tin dressing. Another concentrator which is taking the place of the rack-frame has a wide, endless belt, which is given a rapid vibratory movement in addition to a slow travel in the up-hill direction. Still another form is the shaking table. These modern machines are capable of accurate adjustment, and differentiate more precisely between the various products. If arsenic is present, the partially-dressed product containing that element is roasted in a furnace and the arsenic driven off as the volatile oxide. It is collected in long flues, and forms a valuable by-product. The residue from the furnace is then further dressed to separate iron oxide from tinstone, &c. At a few mines portions of the partially-dressed ore is treated with hot, dilute sulphuric acid to remove iron oxide adhering to other mineral particles.

Generally speaking, the processes described allow of the removal of nearly all the valueless minerals, and also yield, in saleable purity, most of the copper pyrites that may be present. The tinstone so obtained is, however, still mixed with wolfram and with small quantities of other substances. The latter mixture is now roasted and then led to a *magnetic separator*, which separates the various minerals, one from another, by virtue of their differences of magnetic properties. Wolfram is slightly magnetic, and by means of a powerful electro-magnet can be withdrawn from cassiterite, which is non-magnetic. Wolfram, which was formerly merely a troublesome mineral to the tin-dresser, is sometimes worth more than tinstone ; it is the chief ore of tungsten.

In years of normal trade Cornwall produces 4000 to 6000 tons of 'black tin' (dressed tin ore). The output in 1920 was 4858 tons, valued at £161 per ton. In 1922, the worst year tin mining has ever experienced, the output was only 650 tons, worth £77 per ton.

In England the dressed tin ore is reduced in a reverberatory furnace, somewhat similar to that used for smelting copper (see COPPER). It is mixed with one-fifth of its weight of anthracite coal, broken into small pieces, and a small quantity of lime or fluor spar to combine with siliceous matter in order to form a fusible slag. The heat is slowly raised with as little admission of air as possible, so as to maintain a reducing atmosphere. When the charge has been some hours in the furnace it is occasionally stirred to assist the aggregation and separation of the slag, and in about six hours the metal is ready to be run off. The tin flows out of the furnace by an aperture in the middle of one side—towards which all the rest of the bed slopes—into a cast-iron pot, from which it is cast into bars. The tin at this stage contains other metals, such as arsenic and iron, as impurities, so that it requires to be refined, and this is done by *liquation* and *poling*. The process of liquation consists in placing the bars of tin on the hearth of a furnace, such as has been described, and slowly heating them to just above the fusing-point, when pure or nearly pure tin melts and runs down the sloping furnace-bed into a cast-iron vessel, fresh bars being added until enough of the metal is collected. What remains on the hearth is a less fusible alloy of tin with arsenic, iron, and other metals. The nearly pure tin is kept by a fire in the melted state, and stirred up with a pole of green wood, the operation producing a current of gas that agitates the molten metal and causes a scum to rise to the surface, which is skimmed off. The tin is then run into moulds for the market, *grain-tin* being the name given to the best quality of the metal. It is known by its property of becoming brittle when heated to just below its melting-point, so that when it is then let fall from a height, or struck with a hammer, it breaks up into prismatic fragments. Banca tin is the

purest kind made on a commercial scale, and is nearly chemically pure. English tin comes next to it as regards purity.

Applications.—The great consumption of tin is in the formation of alloys, such as bronze, gun-metal, Britannia metal, &c. (see ALLOY), and in the manufacture of tinned iron plates. In the form of an amalgam it is employed for 'silvering' mirrors, and as tinfoil for lining boxes and wrapping up perishable articles. The small gas-pipes of houses are best made of block-tin. Ordinary commercial tin tarnishes very slightly in the air, and is not acted upon by vinegar or the acids of fruits. It is consequently very suitable for coating the inside of cooking vessels, whether made of iron or copper. Large vessels for other purposes formed of these metals are also occasionally coated with tin. In some parts of India vases, jugs, and other useful and ornamental articles are made entirely of tin. The uses of some tin salts are noted above.

See TIN-PLATE, STANNARIES; also following books: Charleton, *Tin Mining* (1884); Memoirs of Geol. Survey, Cornwall and Devon; Annual Report, Secretary for Mines; Rastall's *Geology of the Metalliferous Deposits* (1923); Truscott's *Ore Dressing* (1923).

Tinamou (*Tinamus*), a South American genus of birds sometimes called partridges, but really more akin to bustards, and having affinities with the Rhea and Emu. *T. major* or *brasiliensis* is about 18 inches long.

Tincal. See BORAX.

Tinchebrai, a small town in the extreme north-west of the Norman department of Orne, where Henry I. (q.v.) of England defeated his brother Robert.

Tincture. See HERALDRY.

Tinctures are defined by Sir Robert Christison to be 'solutions of vegetable and animal drugs, and sometimes of mineral substances in spirituous liquids.' The spirit most commonly employed is proof-spirit (see ALCOHOL): sometimes rectified spirit is used, and occasionally ether. Ammonia is sometimes conjoined with the spirit, in which case the solution is termed an ammoniated tincture. The choice between proof and rectified spirit depends on their respective solvent powers over the active principles of the drugs employed. The ether and ammonia are principally used for their antispasmodic properties.

Tindal, MATTHEW, a notable deistical writer, was the son of the rector of Beerferris in South Devon, where he was born in 1656. He was educated at Lincoln and Exeter Colleges, Oxford, took the degree of B.A. in 1676, and was elected fellow of All Souls College. In 1685 he became a Doctor of Law; and after a brief lapse into Romanism during the reign of James II., reverted to Protestantism of a somewhat freethinking type. His first work, *An Essay concerning Obedience to the Supreme Powers* (1693), was followed by others on the powers of the magistrates in religious matters, on the liberty of the press, &c.; but it was not till 1706 that he attracted special notice, when the publication of his treatise on *The Rights of the Christian Church asserted against the Romish and all other Priests* raised a storm of opposition. A perfect torrent of replies and refutations of this statement of state supremacy over the church poured from the press; but even a prosecution failed to prevent the appearance of a fourth edition in 1709, to which a *Defence* was added. On the Continent Tindal's work was quite differently received. Le Clerc praised it as one of the solidest defences of Protestantism ever written. In 1730, when he had nearly reached the age of seventy-three, he published his most celebrated treatise, *Christianity as old as the Creation, or the Gospel a Republication of the Religion of Nature,* which effectually settled the question of his religious creed. The design of the work, which was soon known as 'the Deist's Bible,' is to strip religion 'of the additions which policy, mistake, and the circumstances of the time have made to it'—in other words, to eliminate the supernatural element, and to prove that its morality, which is admitted to be worthy of an 'infinitely wise and good God,' is its true and only claim to the reverence of mankind. Tindal's purpose was rather constructive than destructive; and it was on this account that he called himself a 'Christian Deist.' Answers or refutations were issued by Waterland, Foster, Conybeare (afterwards Bishop of Bristol), Leland (q.v.), and others; the work itself was translated into German. Tindal died at Oxford, still a fellow of his college, on the 16th August 1733. See the article DEISM, and works there cited.

Tindale, WILLIAM. See TYNDALE.

Tinder, an inflammable material, usually made of half-burned linen. It was one of the chief means of procuring fire before the introduction of chemical matches. The tinder was made to catch the sparks caused by striking a piece of steel with a flint; and the ignited tinder enabled the operator to light a match dipped in sulphur. This intermediate step was necessary in consequence of the impossibility of making the tinder flame. Partially decayed wood, especially that of willows and other similar trees, also affords tinder; and certain fungi furnish the German tinder, or Amadou (q.v.).

Tinea, the generic name of certain diseases of the skin caused by the growth of microscopic fungi. See under FAVUS, PITYRIASIS, RINGWORM.—For the clothes moths called Tinea, see MOTHS.

Tineïdæ, a family of small Moths (q.v.).

Tinfoil. See FOIL.

Ting-hai. See CHUSAN.

Tinker's Weed (*Triosteum perfoliatum*, erroneously called Tinkar's-root), the Fever-weed, a plant of a small genus of Caprifoliaceæ, with purgative and emetic properties, so called after an 18th-century New England doctor. It is a perennial plant with white flowers, red berries, and a large woody root. It extends from Ontario to Louisiana and west to Minnesota.

Tinned Meat. See PRESERVED PROVISIONS.

Tinnevelli (*Tiru-nel-véli*), chief town of the district of the same name, in the south of the Madras Presidency, is situated on the left bank of the river Tambraparni. The town of Tinnevelli is connected with the town and military station of Pallamcotta, on the opposite bank of the river, which is the administrative headquarters of the district. It contains a Sind temple and a Hindu college, and has a cotton-factory. It is an important Protestant missionary centre. Pop. (1921) 53,783.

Tinnitus Aurium is the Latin translation of, and ordinary medical term for, ringing in the ears. In most cases it is an unimportant symptom, depending on some local temporary affection of the ear, or on some disturbance of the digestive system with which the part of the brain, from which the auditory nerve springs, sympathises, or which excites the cerebral circulation (as often occurs in the morning after too liberal evening potations); but, as it is also a common symptom of organic disease of the auditory nerve, it may indicate a dangerous condition, or may be a prelude to complete deafness. Hence, although commonly of no consequence, it is a symptom that, especially if permanent, must be carefully watched. It may be readily induced for a few hours by a large dose of quinine, salicin, or their compounds. Tinnitus

is of course the proper pronunciation, but in medicine it is usually called *tinnĭtus*.

Tino. See TENOS.

Tin-plate is an important branch of the metallic industry of Britain. The art of tinning plate-iron is said to have been invented in Bohemia, about the beginning of the 16th century, although the tinning of copper was known earlier. Tin-plate was first made in England about 1670. Sheet-iron for tin-plates is made either of charcoal-bar or coke-bar, which has been rolled with particular care, in order to avoid scales on the surface. Formerly iron plates only were used in the manufacture of tin-plates, but mild steel has almost superseded iron for the purpose. Before tinning the plates are called 'black plates.' When the sheet has been cut to the required size the plates are 'pickled'—i.e. they are immersed in hot sulphuric or hydrochloric acid which has been diluted by 16 parts of water to 1 of acid, the use of the acid being to remove all oxide. After this the plates require to be washed several times in water, and then annealed. They are next passed two or three times through chilled iron rollers highly polished with emery and oil, to give them a smooth, even surface. Once more they are sent to the annealing furnace, passed again through dilute sulphuric acid, which is followed by another washing, but this time in running water, and then scoured with abrasive. This should leave them quite clean and bright.

Each plate is now put singly into a pot of melted grease or palm oil, and left till it is completely coated, after which the plates are taken in parcels and plunged into a bath of melted tin covered with oil, called the 'tin-pot.' In the high-class qualities the plates remain in successive pots to 'soak,' which results in a more firmly adherent coating of pure tin. The plates are afterwards put in parcels into a vessel, where the coating of pure tin is further built up, and are then withdrawn one by one, and wiped on both sides with a hemp brush, the marks of which are obliterated by another dipping. This last dipping also gives the plates a polish. The superfluous tin is removed by immersing the plates in a pot containing tallow and palm-oil, maintained at a temperature just high enough to allow the tin to run off. The final treatment consists in working the plates separately in troughs of bran with a little meal, and then rubbing them with flannel. Sheet-steel being more readily oxidisable than pure charcoal iron, it is necessary that the tin coating should be impervious and unbroken. Tin plates are generally 20, 22, or 25 inches long by 14, 15, or 17 inches wide, and of 20 to 30 BG (=Birmingham gauge for sheets and hoops) in thickness. To avoid confusion with the different wire gauges the thickness is sometimes also given in 'mils,' 1 mil=$\frac{1}{1000}$ inch. For further information on gauges, see under WIRE.

Tin-terne may be had in larger sizes and special cut shapes. The sheets are covered with an alloy of lead and tin of proportions from 2 to 1 to 1 to 2, and are suitable for motor-car and railway-carriage panels, and petrol tanks, &c. They can also be supplied in copper-soft qualities for subsequent working up; they are, however, unsuitable for use in contact with food. Lead-coated or terne-finish sheets are used in the same way. There is sufficient tin present to bind the lead alloy to the steel sheet. They can be hammered or bent to shape and the lead surface takes paint, &c., with very little preparation.

Tinsel. See FOIL.

Tintagel Head, a cliff 300 feet high on the western coast of Cornwall, about 22 miles W. of Launceston, and but 6 miles from Camelford—the Camelot of Arthurian legend. Partly on the mainland and partly on the so-called island, almost cut off by a deep chasm from the rest of the promontory, stand the imposing ruins of the castle where King Arthur held his court. His spirit still hovers around the scene of his splendour in the form of the red-legged chough, a beautiful Cornish bird already rare in Leland's time. The oldest part of the existing ruins is the keep, apparently of Norman construction, but there need hardly be a doubt that a Saxon, and perhaps earlier a British stronghold occupied the same site. The castle was still habitable in 1360, when we read of its being provisioned.

Tintern Abbey, perhaps the most beautiful ruin in England, on the right bank of the Wye, in Monmouthshire, about 5 miles above Chepstow. The abbey was founded in 1131 for Cistercian monks, but the church, the finest part of the ruins, dates from the end of the following century. The length of the building is 228 feet; the style of architecture a transition from Early English to Decorated; the window-tracery is especially fine. But the greatest glory of Tintern Abbey is that its name is associated with Wordsworth's noblest poem, *Lines composed a few Miles above Tintern Abbey*—though, as every reader knows, the abbey itself is not mentioned in it.

Tintoretto (in English often shortened into *Tintoret*), a great Italian painter, so called from the fact of his father being a dyer (*Tintore*). His real name was Jacopo Robusti. Born at Venice, 29th September 1518, he studied for a short time under Titian, but appears to have been for the most part self-taught. His motto was 'The design of Michelangelo and the colouring of Titian'; and his aim was obviously to combine the dignity of the Florentine with the romanticism of the Venetian; but, though in the estimation of most of his contemporaries he succeeded, there has subsequently been diversity of opinion as to his merits. One of Ruskin's 'five supreme painters,' he was unquestionably a great master of composition, drawing and colour; he possessed an exuberant imagination, and his conceptions are often grand, his chiaroscuro startlingly effective. Contrast and conflict is the keynote to his work. He was strangely unequal, though he was always a hard and conscientious worker; some of his earlier pictures are very carefully finished, but his later ones are dashed off with a fatal haste that justifies the epithet *Il Furioso*, and the remark of Annibal Caracci, that 'if he was sometimes equal to Titian, he was often inferior to Tintoretto.' His portraits are generally admirable. Many of his pictures are of prodigious size, as he received commissions to decorate the church of the Madonna dell' Orto, the Scuola di S. Marco, the church of S. Rocco, the Ducal Palace, &c. Of the innumerable pictures in the galleries that are attributed to him not a few are by other hands. Most of the examples of his art are to be found in Venice, but there are a number in England, including 'St George and the Dragon,' and 'The Origin of the Milky Way,' in the National Gallery at London. Other famous pictures from his hand are 'Belshazzar's Feast, and the Writing upon the Wall' (fresco, for the Arsenal at Venice), 'The Tiburtine Sibyl,' 'The Last Supper and the Washing of the Disciples' Feet,' 'The Crucifixion,' 'The Worship of the Golden Calf,' 'The Last Judgment' (the last two immense pictures 50 feet high, and very splendid in conception), 'St Agnes restoring to Life the Son of a Prefect,' 'The Miracle of St Mark,' 'The Resurrection,' 'The Slaughter of the Innocents,' and the largest picture on canvas by any great master, the 'Paradise' (1588) of the Ducal Palace at Venice, 34 feet high by 74 long, and containing over 100 figures. Tintoretto, who ranks as

the head of the later Venetian school, married Faustina de' Vescovi, and had two sons and five daughters. He lived practically all his life in Venice, and died there of fever, 31st May 1594.

See Crowe and Cavalcaselle's *Titian* (1876) and Ruskin's *Stones of Venice* (1851–53); monographs on Tintoretto by Osler (1879), Stearns (New York, 1895), Thode (in Ger. 1901), Holborn (1903), Mrs Bell (1905), E. M. Phillipps (1911).

Tinworth, GEORGE (1843–1913), artist in terra-cotta, was born in London, the son of a poor wheelwright, and while working in his father's shop took to wood-carving of his own accord. In 1861 he found opportunity to get lessons in an art school at Lambeth, and in 1864 entered the Royal Academy schools. He soon began exhibiting figures and groups of figures at the Royal Academy, and in 1867 obtained a permanent appointment in the great Doulton art pottery. The works by which he became famous were mainly terra-cotta panels with groups of figures in high relief illustrating scenes from sacred history, which happily combine grace, strength, and dignity with originality of design, dramatic effectiveness, and devout feeling. An important example is the reredos in York Minster, with twenty-eight terra-cotta panels.

See an *Essay on the Life and Works of G. Tinworth*, by E. W. Gosse (1883).

Tippecanoe, a river of Indiana, which rises in the northern part of the state, flows WSW. and S. 200 miles, and empties into the Wabash 10 miles above Lafayette. It is famous for the battle fought near its mouth, November 7, 1811, in which the Indians, under Tecumseh's brother, the prophet, were defeated by General Harrison.

Tipperah (*Tipura*), a district of the division of Chittagong (q.v.); Hill Tipperah being a small tributary state on its borders.

Tipperary, an inland county of the Irish province of Munster, touching Galway on the north and King's County, Queen's County, and Kilkenny on the east. Area, 1644 sq. m., or 1,051,904 acres, of which four-fifths are arable. The county of Tipperary for the most part lies in the basin of the river Suir (total length 85 miles); the Shannon touches the north-west border. The surface is generally level, but is diversified by several mountain ridges or groups. These mountains are the Galtees, rising to 3008 feet, Knockmeledown (2609 feet high), and Slievenaman on the south; Keeper Mountain on the west; and the Slievardagh Hills on the east. There is one very curious isolated height called the Devil's Bit, to which many popular legends attach. The soil of the plain is a rich calcareous loam, singularly fertile and productive, especially the district called the Golden Vale, in which stands the town of Tipperary. In geological formation the plain belongs to the great central Carboniferous Limestone district. Anthracite coal is worked; copper, lead, and zinc occur in smaller quantities; and slates and pipeclay are available. The principal occupation is agriculture, especially dairy-farming. The county is divided into two ridings, North and South, each of which is subdivided into six baronies. Pop. (1841) 435,553; (1871) 216,713; (1881) 199,612; (1901) 160,232; (1911) 152,433, all but 8000 Roman Catholics; (1926) 140,946. The county town is Clonmel.

Anciently Tipperary formed part of the two distinct principalities of Ormond, or North Munster, and Desmond, or South Munster. After the English invasion it was formed into a county by King John in 1210; but the authority of the conquerors was long little more than nominal. Eventually it came to be divided between the Anglo-Norman families of Butler, which held Ormond, and Geraldine, to whom a portion of Desmond fell. The antiquities are numerous, as well Celtic as Anglo-Norman. In the latter the city of Cashel (q.v.) is specially rich; and Holy Cross is a noble monastic ruin, whilst the castle of Cahir is a fine specimen of baronial architecture. There is a series of caves near the border of the county of Cork.

Tipperary, a town of County Tipperary, is 110 miles SW. of Dublin by rail, with a Catholic and a Protestant church, and a 13th century priory gateway. Various milk products are manufactured. Pop. (1926) 5554. In 1890, under the 'Plan of Campaign,' a 'New Tipperary' was founded to thwart the proprietor of the land on which Tipperary town is built, and opened on 12th April; but the scheme wholly collapsed in the course of the following year, though the suburb remains.

Tippermuir. See MONTROSE.

Tippoo Sahib (more correctly *Tipú Sultan*), sultan of Mysore, and son of Hyder Ali (q.v.), was born in 1749. Efforts were made to instruct him carefully in the various branches of learning cultivated by Mohammedans; but Tippoo much preferred the practice of athletic exercises, and the companionship of the French officers in his father's service, from whom he acquired a considerable acquaintance with European military tactics. This knowledge he put to effective use during his father's various wars, by completely routing Colonel Bailey (1780 and 1782), and Colonel Braithwaite on the banks of the Coleroon (1782), though these were his only important engagements with the British forces in which he could boast of success. On the death of his father he was crowned with little ceremony, returning at once to the head of his army, which was then engaged with the British near Arcot. In 1783 he captured and put to death most of the garrison of Bednur; but news of the peace between France and England having reached his French allies, they retired from active service, and Tippoo ultimately agreed to a treaty (1784) stipulating for the *status quo* before the war. During the continuance of this peace he occupied himself in regulating the internal administration of Mysore, sent ambassadors in 1787 to France to stir up a war with Britain, and, failing in this, at length so far allowed his inveterate hatred of the English to overcome his judgment as to invade (1789) the protected state of Travancore. In the ensuing war (1790–92) the British, under Colonel Stuart and Lord Cornwallis, were aided by the Mahrattas and the Nizam, who detested their powerful and aggressive neighbour; and though the tactics of the sultan in laying waste the Carnatic almost to the very gates of Madras baffled his opponents for a time, he was ultimately compelled (1792) to resign one-half of his dominions, pay an indemnity of 3030 lakhs of rupees, restore all prisoners, and give his two sons as hostages for his fidelity. Nevertheless his secret intrigues in India against the British were almost immediately resumed; another embassy was sent to the French; and the invasion of Egypt by the latter in 1798 and Tippoo's machinations having become known to the governor-general almost simultaneously, it was resolved to punish the perfidious sultan. Hostilities commenced in March 1799, and two months after Tippoo was driven from the open field, attacked in his capital of Seringapatam, and after a month's siege slain in the breach at the storming of the fort (4th May). He was buried, during an appalling thunderstorm, in the mausoleum he had built for his father. His government of Mysore after 1792 was most oppressive, yet Tippoo was extremely popular, and was esteemed by the Mohammedans as a martyr. See L. B. Bowring, *Haidar Ali and Tipú Sultán* (1893).

Tipton, a town of Staffordshire, 4½ miles SSE. of Wolverhampton and 8½ NW. of Birmingham, since 1918 part of Wednesbury parliamentary borough. It has important iron manufactures. Pop. 34,000.

Tipula. See DADDY-LONG-LEGS.

Tiraboschi, GIROLAMO, the historian of Italian literature, was born at Bergamo, 28th December 1731, studied at Monza, became a Jesuit, and was afterwards appointed to a chair of Rhetoric at Milan, and in 1770 became librarian to the Duke of Modena. Here he wrote his *Storia della Letteratura Italiana* (13 vols. 1772–82), an elaborate, accurate, and exhaustive survey down to the close of the 17th century. A continuation embracing the literature of the 18th century was written by Lombardi. Tiraboschi died at Modena, 3rd June 1794. Other works are *Vetera Humiliatorum Monumenta* (3 vols. 1766–68), *Biblioteca Modenese* (1781–86), and *Memorie Storiche Modenesi* (1793).

Tirah, a mountainous district of the North-West Frontier Province of India, and the scene of the Tirah Expedition (1897–98) against the Afridi and Orakzai tribes.

Tirana, capital of Albania, lies inland, 20 miles E. of Durazzo, with which it is connected by rail. Pop. 14,000.—The treaty of Tirana between Albania and Italy in 1926 caused a commotion among the Serbs.

Tiree. See TYREE.

Tiresias, in Greek Mythology, figures as a famous prophet, who, according to one legend, was struck blind by the goddess Athena, because he had seen her bathing. Another legend represents Hera as depriving him of his sight because, being made arbiter in a dispute between her and Zeus, he had decided in favour of the latter; when Zeus as a compensation granted him the inner vision of prophecy, and prolonged his life for several generations. He is consequently prominent in many of the mythical stories of Greece, but at last found death after drinking from the well of Tilphossa. Tiresias is the theme of a fine poem by Tennyson (1885).

Tirhut, formerly a district of Bengal, but divided into the districts of Darbhanga and Muzaffarpur, now in Bihar and Orissa.

Tirlemont (Flemish *Thienen*), a town of Belgium, in South Brabant, on the Great Geete, 30 miles ESE. of Brussels by rail. It has two fine churches of the 12th and 13th centuries, and manufactures of machinery, hosiery, flannel, leather, sugar, &c. Once a large and prosperous city, Tirlemont was ravaged by Marlborough in 1705; and here the French, under Dumouriez, defeated the Austrians in 1793. Pop. 20,000.

Tirnova. See TRNOVO.

Tirol (in English often *the Tyrol*), was a crownland of the Austrian Empire till its dissolution, when it was divided, the smaller northern part remaining a land of the Austrian republic, while the greater southern part was given to Italy by the treaty of Saint Germain (1919, ratified 1920). It is a mountainous country, traversed from east to west by the three chains of the Alps, whereof the southern chain is crossed by the Stelvio Pass (q.v.), while the central chain (11,000 to 12,000 feet) crossed by the Brenner Pass (q.v.) has been made the frontier. A German population, however, in language and sympathies, with a small proportion of Ladins, extends southwards to Salurn, between Bozen (Ital. *Bolzano*), and Trent, and has been subjected to a process of forcible Italianisation. The Tirolese are noted for their fidelity to the Catholic faith and their devotion to their country, but are somewhat backward in education. The romantic mountain scenery attracts thousands of visitors. The more important valleys are formed by the river Inn (flowing north to the Danube) and the Adige (going south to the Adriatic), and their tributaries. Pastoral pursuits furnish the chief occupations, though some grain is grown, and considerable attention is paid to the cultivation of the forests (about half of the area), and of fruit, wine, and silkworms. The mines were formerly of great value; but little is now extracted, except of salt (at Hall), anthracite, and a little iron. Metal industries flourish in German Tirol, and silk in Italian. The Austrian land of Tirol has an area of 4882 sq. m. and a population (1923) of 314,836. The capital is Innsbruck (q.v.), with a university (1677).

Venezia Tridentina, often called the Trentino, the territory gained to Italy by the St Germain treaty, was in 1926 formed into two provinces, Bolzano, mostly German-speaking (2831 sq. m.; pop. in 1921, 235,487), and Trento, Italian-speaking (2539; 406,260). The principal towns in the former are Bozen and Meran (Ital. *Merano*). Near Meran is the castle of Tirol (Ital. *Tirolo*) from which the whole takes its name; and not far off is Andreas Hofer's home. Trento or Trent is the subject of a separate article.

Tirol, the ancient Rhætia, was conquered by the Romans under the Emperor Augustus. After the fall of the empire it was occupied by the Boiardi (Bavarians) and Langobardi. During the middle ages the most important rulers in Tirol were the counts of Tirol and the bishops of Trent and Brixen. In 1363 the counts bequeathed their possessions to the Duke of Austria, and except during the short period 1806–14, a period made memorable by the patriotic resistance of Andreas Hofer (q.v.) and his associates against French and Bavarians, they formed an appanage of the House of Hapsburg to its fall. The division of Tirol under the treaty of Saint Germain has been described above. By plebiscite in 1921 Austrian Tirol declared almost unanimously for union with Germany, which was vetoed by the Entente Powers. German-speaking South Tirol has protested against Italian domination and the suppression of the German language.

See Miss Busk, *Valleys of the Tyrol* (1874); Zingerle *Sagen aus Tirol* (1859); W. D. MacCrackan, *The Tyrol* (1909); Baedeker; and histories by Egger (1872–80) and Jäger (1880–91); Herford, *The Case of German South Tyrol* (1927).

Tironensians, or TYRONENSIANS, a congregation of Benedictines (q.v.).

Tironian Notes. See SHORTHAND.

Tirpitz, ALFRED P. FRIEDRICH VON, born at Küstrin in 1849, entered the Prussian navy in 1865, was ennobled in 1900, and rose to be Lord High Admiral (1911). As Secretary of State for the Imperial Navy (1897–1916) he piloted the German navy laws (1900, &c.) and raised a fleet to challenge British supremacy of the seas. A ruthless upholder of 'frightfulness,' he commanded the German navy from August 1914 to March 1916. He wrote *Memoirs* (1919) and *Germany's Impotence in the World War* (1926). He entered the Reichstag in 1924 as a member of the German National Party.

Tirso de Molina. See TELLEZ.

Tiryns, an ancient city of Argolis, in the Peloponnesus, situated a short distance SE. of Argos, about 3 miles from the head of the Argolic Gulf. In fable it was founded by Prœtus, brother of Acrisius, and predecessor of Perseus, and here the early life of Herakles (*Tirynthius*) was spent. About 468 B.C. the city was destroyed by the Argives, but the ruined walls of the citadel re-

mained the wonder of later ages. The Cyclopean walls of Tiryns and of the neighbouring city of Mycenæ are the grandest in Greece. The citadel was built on an oval-shaped rock, 330 yards long by 112 at its widest, fringed by a wall, 30 to 40 feet thick, and about 50 feet high (from the outside base), composed of blocks, bedded in clay, 10 feet long by 3½ wide. The area of the city was divided into three parts at successive levels, and one of these was completely excavated by Schliemann in 1884–85, thus exposing the complete plan of a Greek palace of the 11th or 10th century B.C. An older palace was excavated in 1914.

Tischendorf, Lobegott Friedrich Konstantin von, a very eminent biblical scholar, was born at Lengenfeld in Saxony on January 18, 1815, and studied theology and philology at Leipzig, where in 1839 he became a university lecturer. His labours in search of the best and most ancient MSS. of the New Testament, in which he was liberally assisted by the Saxon and Russian governments, were exceedingly valuable, especially those in 1844, 1853, and 1859, which resulted in the discovery of the Sinaitic Codex (see Codex) at the monastery on Mount Sinai; those journeys he described in *Reise in den Orient* (2 vols. 1846; Eng. trans. 1847) and *Aus dem Heiligen Lande* (1862). Among the most important of his numerous works are the editions of the Sinaitic (1862; in fac-simile in 1863) and many other MSS. of the New Testament; the *Eighth Critical Edition of the New Testament* (1864–72), and several other editions of the New Testament text; an edition of the Septuagint; and the *Monumenta Sacra Inedita* (1846–71). The pamphlet *When were our Gospels Written?* defending the genuineness and authenticity of the four gospels, was translated into English in 1866. After being an extra-ordinary and ordinary professor at Leipzig from 1845, he became professor of Theology and of Biblical Palæography in 1859, a chair in the latter subject having been instituted for him. He was created a Count of the Russian empire, an LL.D. of Cambridge, a D.C.L. of Oxford, &c. He died on December 1, 1874. There is a sketch of his life by Volbeding (1862).

Tissandier, Gaston. See Balloons and Aeroplanes.

Tissaphernes, Persian general, son of Hydarnes, played off Athens against Sparta when satrap of Lydia and Caria in 413 B.C., but was deprived of the former province in favour of Cyrus in 407. Three years later he denounced Cyrus to the new king Artaxerxes, and was mainly responsible for the victory of Cunaxa in 401, when Cyrus was killed (see Xenophon). Tissaphernes was loaded with honours, tried to destroy by treachery the Greek mercenaries who now began the famous March of the Ten Thousand, but in the war with Sparta was beaten by Agesilaus. He was put to death through the instigation of the mother of Cyrus in 395.

Tissues, aggregates of cells which have certain characters in common. They may be classified in various ways according as attention is directed to their structural, functional, or developmental characters. Thus, in an animal, 'cellular tissues,' in which the unit elements retain their distinctness, may be distinguished from those of muscle and nerve, in which there is usually much modification and integration of the component cells. Or, in plants, 'cellular tissues' may be distinguished from 'vascular tissues,' in which the component cells are fused to form vessels. In these distinctions only structural characters are considered. Again, we may distinguish in an animal nervous tissues, muscular tissues, glandular tissues, skeletal tissues, and so on, the classification here depending on the function. In the same way the tissues of a plant may be distinguished as absorptive, assimilative, conductive, glandular, skeletal, protective, and so on. In short, the physiological conception of a tissue is that of an aggregate of cells in which by division of labour within the body there has come to be a predominance of one function. Or, if we consider the origin of the several tissues from the different layers of the embryo, we distinguish the ectodermic or epiblastic, the mesodermic or mesoblastic, the endodermic or hypoblastic tissues of animals, and similarly in higher plants we distinguish those which arise from the dermatogen, periblem, and plerome of the embryo or growing-point. The commonest classification of animal tissues is perhaps that which distinguishes four sets—(*a*) epithelial, including covering and lining layers of cells, and their secretory or other modifications; (*b*) muscular; (*c*) nervous; (*d*) connective tissues; but the last includes a great variety—e.g. bone, cartilage, ligaments, and enswathing membranes. One of the most convenient classifications of vegetable tissue is that which distinguishes (*a*) cellular tissues—epidermis, parenchyma, prosenchyma; (*b*) vascular tissues—wood and bast vessels, and laticiferous vessels.

See the articles Bark, Bast, Bichat, Bone, Brain, Cell, Circulation, Digestion, Embryology, Epidermis, Epithelium, Horn, Kidneys, Leaf, Muscle, Nervous System, Physiology, Reproduction, Respiration, Skin, Wood, &c.

Tisza, Kalman (1830–1902), Hungarian statesman, was premier and virtually dictator from 1875 to 1890.—His son, Count Stephen Tisza (1861–1918), a chauvinistic Magyar, premier of Hungary 1903–5, 1913–17, supported Germany, and was assassinated.

Tit, or Titmouse, a name given to several genera of Passerine birds in the family Paridæ. The typical tits are small birds, of which there are over sixty species, widely distributed throughout Europe, Asia, Africa, and North America. They are more numerous in cold and temperate than in tropical regions, those which are found within the tropics being mostly inhabitants of elevated mountainous districts. The bill is small, short, somewhat conical, the tip entire, the base beset with hairs, and the nostrils generally concealed by feathers. The wings are not very long; the tail is rounded or even; the legs rather short, slender, scaled in front, the inner toe shortest, the claws long and curved. The plumage is soft, lax, and fluffy, often gay. The popular name Titmouse is

Blue Tit (*Parus cæruleus*).

derived from Old English *máse*, a small bird (*tit*, 'small'). The tits are bold sprightly birds, extremely active, flitting from branch to branch, running rapidly along branches in quest of insects,

and often clinging back-downwards to the under side of branches. They feed not only on insects but on grain and seeds. They are very pugnacious, and the female tit shows great courage in defence of her nest, often continuing to sit when the nest is approached, and vigorously assailing the intruding hand with her bill. In winter many of the species gather into small flocks, and approach houses and villages, competing with sparrows and chaffinches for a share of the food of domestic poultry. Most of the tits lay at least six eggs, some of them twelve or more, and even in temperate countries they often produce two broods in a year. They generally build in holes in trees &c. The young are fed chiefly on caterpillars. A pair of blue tits have been observed to carry a caterpillar to their nest, on an average, every two minutes during the day, so that these birds must be extremely useful in preventing the multiplication of noxious insects. Six species are found in Britain, but one of them, the Crested Tit (*Parus cristatus*), is very local, being almost entirely confined to a few old pine-forests in Scotland. The Great Tit (*P. major*) is the largest European species. It is common in almost all parts of Europe. It is not quite six inches long; the head and throat are black; the cheeks are white; the breast and sides yellowish; the wings and tail grayish. Its usual note is a kind of chatter, but it sometimes imitates the notes of other birds. The Blue Tit (*P. cæruleus*) and the Cole Tit (*P. ater*) are very common in Britain. The blue tit is perhaps the most pert and audacious of all the British species. It very generally receives the familiar name of *Tomtit*. The upper part of the head is light blue, and a bluish tinge prevails in the plumage. The Long-tailed Tit (*Acredula caudata*), common in Britain, has the tail about as long as the body. Its crown is white, contrasting beautifully with the deep black of the back; the tail is also black, with white edges. The nest of this bird is a beautiful structure, of moss and wool externally covered with lichens, and profusely lined with feathers, nearly oval, with a small hole in the upper part of one side. Still more interesting is the nest of the Penduline Tit (*Aegithalus pendulinus*) of the south of Europe, which in form resembles a flask, and is generally suspended at the end of a flexible twig, in a situation near to or overhanging water. It is nicely woven of fibres of bark

Long-tailed Tit (*Acredula caudata*).

and the down of willow or poplar catkins, and the opening is in the side. The Chickadee or Black-cap Tit (*P. atricapillus*) is very common in North America. The Tufted Tit (*P. bicolor*) is the largest American species. British specimens of the Cole and Long-tailed Tits differ somewhat from continental examples. The so-called Bearded Tit (*Panurus biarmicus*) belongs to a distinct family (Panuridæ). It frequents reed and osier beds, and the male is tawny, with gray head and black moustaches, which ornaments are absent in the female. It is now restricted to the Norfolk Broads and one locality in Devon. See Coward's *Birds of the British Isles* (1920).

Titania. See MAB, OBERON.

Titanium (sym. Ti; atom. number 22; atom. wt. 48·1) is a comparatively rare metal, which, according to the method by which it is procured, occurs as a gray, heavy, iron-like powder, which burns with brilliant scintillations in the air, forming titanium dioxide and nitride. It decomposes water at the boiling-point and is soluble in hydrochloric acid. Present as the dioxide in Rutile (q.v.), brookite, and anastase, it is now used in the purification of iron and steel in process of manufacture, and has been employed as an electrode in arc-lighting, and for making white paint. It readily combines with nitrogen under the influence of heat.—*Titanite*, or sphene, is a soft mineral, green, yellow, or yellowish green, has strong refractive and dispersive power on light, with brilliant diamond-like colour-effects. It is often present in Syenite (q.v.).

Titanosaurus. See ATLANTOSAURUS.

Titans, in Greek Mythology, were the sons and daughters of Uranus (Heaven) and Gæa (Earth), amongst whom were Kronos (see SATURN), Oceanus, Rhea, &c. Instigated by their mother, the Titans, headed by Kronos, rose against their father, emasculated and deposed him, and liberated their brothers, the Hecatoncheires (Hundred-handed) and the Cyclopes (q.v.), from Tartarus. Kronos, being made king, married his sister Rhea. Zeus, the son of Kronos and Rhea, waged against his father and the other Titans a ten years' war, in which the Titans were defeated and hurled into Tartarus. During the war Zeus and his allies occupied Mount Olympus in Thessaly, his opponents being encamped on Mount Othrys. The name of Titans is also given to the descendants of the Titans, such as Prometheus, Hecate, Helios, Selene, &c. See GIANTS, ZEUS.

Tithe, 'the tenth part of the increase yearly arising from the profits of lands, stocks upon lands, and the industry of the parishioners, payable for the maintenance of the parish priest, by everyone who has things titheable, if he cannot show a special exemption.' Tithes were classified into 'predial,' such as arose directly from the soil, e.g. corn, hay; 'mixed,' the produce of animals nurtured upon the lands, e.g. calves, milk, eggs; and 'personal', arising wholly from the labour and industry of man, e.g. tithes of mills and fishing. 'Personal' tithes included much more originally; but, as they soon fell practically into desuetude, the matter need not be elaborated here.

The term 'tithes' is now a misnomer, inasmuch as by the Commutation Act, 1836, the system of payment in kind was displaced by a tithe rent-charge in money upon the hitherto titheable lands. The former system, which obtained from very ancient times, was so complicated and vexatious that it led to constant friction in most parishes, and the courts were frequently called upon to adjudicate upon some dispute between the tithe-owner and the tithepayer. One instance must suffice, which, however, will show how easily disputes could arise. The court had to settle whether or not the tenth meal of milk meant both morning and evening, and whether or not such milk must be fetched from the farm! This system of tithing in kind had become so irritating that previous to the legislation in 1836 a composition in money had

been substituted therefor in a large number of parishes by voluntary agreement between the two parties concerned. The Commutation Act made monetary payments universal, compulsory, and permanently obligatory. The value of the rent-charge, in lieu of tithes in kind, was based upon the seven years' averages of wheat, barley and oats. These values varied from year to year (1836–1918). It was once as high as £112, 15s. 6¾d. (1875), and once as low as £66, 10s. 9¾d. (1901). The average value of £100, as commuted, during the above period, was £91, 19s. 9¼d.

The early history of tithes is wrapped in considerable obscurity. Their payment was originally based upon religious duty, and was enforced, as such, by ecclesiastical measures and discipline, as far as that was possible. In course of time, their payment became legally obligatory. This does not mean that the state instituted the payment of tithes, only that after such payment had become customary, it gave legal sanction thereto. 'It created no new burden; it appropriated no part of what hitherto had been a public fund or public revenue.' Thus, the payment of tithes passed from a merely moral duty to a legal duty also. That stage commenced in England in 970 A.D., and it has continued as such ever since. It is sometimes affirmed that the tithes were to be divided into three parts, one of which was to be devoted to the maintenance of poor parishioners; but the late E. A. Freeman, regius professor of Modern History at Oxford (1884–92), averred that he 'knew nothing of any English authority for the threefold division of tithe.'

The definite parochial system did not come into existence before the end of the 12th century. Previously, the tithes had been paid to corporations sole, e.g. the bishops, or to corporations aggregate, e.g. deans and chapters, and monasteries. But when the parochial system obtained, landowners were encouraged to set apart tithes for particular parishes in which they were interested. It became the practice of monastic houses to get the tithes attached to them, and to provide for the spiritual ministrations in parishes by the appointment of vicars. Such attachments are technically termed 'appropriations.' By the 16th century more than one-third of all the parishes in England were thus 'appropriated.' The parishes were often ill-served, and the vicars compelled, in many cases, to exist on a mere pittance doled out to them by the 'appropriators.' The Act 15, Richard II. (A.D. 1391), was passed to secure more adequate payments to vicars.

At the dissolution of the monasteries in Henry VIII.'s reign, the appropriations belonging to them would have been disappropriated, had not a clause been inserted in the relative statutes to give them to the king. Many of these 'appropriations' passed into the hands of lay-persons by grant from the crown, and such owners are called 'impropriators,' and the tithes in their possession, 'impropriate tithes.' These are a definite form of property, as tithes attached to the benefice (spiritual tithes) are; and as teinds in Scotland are. We have seen that the payment of tithes in kind continued during the period down to 1836, with the exceptions noted above. Since then it is proper to speak of tithe rent-charge, and the payment entered upon a new era or stage. From 1836 to 1918 various statutes dealt with this charge in various ways, some thirteen dealing with, among other matters, the extinguishment of the charge by redemption. The Act of 1891 made the landowner responsible for the payment of the charge, as had, apparently, been the intention of the Act of 1836; but in practice it became customary for the charge to be collected from the occupier.

In 1914 the benefice-tithe of the Church in Wales was alienated therefrom, and handed over to Welsh Church Commissioners for other purposes, just as in 1869, the rent-charge belonging to the Church of Ireland was transferred to Commissioners of Church-temporalities. The value of the tithe rent-charge in the hands of the former is, approximately, £210,000 per annum.

We have seen that from 1836 the annual values of tithe varied, but in 1918 there came a change in that respect. Owing to war-conditions, the annual values rose from £75, 16s. 4d. gradually to £109, 3s. 11d. in 1918, and as there was every prospect of it rising still higher, the legislature passed an act which, amongst other things, stabilised the value at that figure for the next seven years. How true the forecast was as to a further rise is seen from the facts that, but for that restriction, the values would have been, in nearest pounds, £123 in 1919; £140 in 1920; £162 in 1921; £172 in 1922; £171 in 1923; £165 in 1924; £155 in 1925; £146 in 1926.

It is estimated that ecclesiastical tithe-owners lost by that restriction an aggregate sum of about six million pounds, and of course impropriators lost proportionately on their similar property of about £796,000 per annum. Ecclesiastical tithe-owners hold tithe rent-charge of some £2,005,000 per annum; and the Ecclesiastical Commissioners, for church purposes, about £276,000 per annum.

It was admitted by the minister in charge of the bill in 1918 that 'when the tithe rent-charge rises, even if it rises to £182, the tithe-owner only gets that which the Commutation Act intended him to get'. . . the clergy could not rightly be called profiteers.' The Act of 1918 altered the seven years' average to fifteen years', and it has been found that the value of the charge would have been £133 in 1927. It was not allowed to reach that figure, as will be seen below.

Another thing that this act did was that it facilitated the redemption of the charge. Such procedure had been possible since 1846; very little however, was redeemed; but, in consequence of the provisions of the Act of 1918, the volume increased very largely. From 1846 to 1918 only £70,000 worth had been redeemed; but from 1919 to 1923 the amount thus extinguished was £271,000. These official figures speak for themselves.

We come now to the last stage in the history of this charge under brief review. It was anticipated, rightly, that the value even under a fifteen years' average would exceed the value as stabilised in 1918. Partly in consequence of such forecast, and partly for other reasons, the legislature passed the Act of 1925, after consultation had with the various interested parties.

This act did three things chiefly. (1) It stabilised the value of all tithe rent-charge at £105; (2) It vested all ecclesiastical tithe rent-charge in the Governors of Queen Anne's Bounty, who became the owner-trustees of the charge; (3) it provided a compulsory scheme for the ultimate extinguishment of ecclesiastical tithe rent-charge by forming an annual sinking-fund of £4, 10s. for every £100 as commuted. By such scheme, benefice-tithe will be extinguished in 85 years, and that held by ecclesiastical corporations in 81½ years. Tithe-payers, thus, pay in respect of these two rent-charges £105 *plus* the sinking fund (£4, 10s.) per annum, and in respect of impropriated tithe, £105 per annum. It may be added that each of these holders is subject, in varying degrees, to the payment of local rates on the charge.

Since the passing of the act, machinery has been evolved for dealing with ecclesiastical tithe rent-charge in the 7500 or so parishes concerned. The chief of these methods is the one set up by the act, viz. area-committees, 15 in number, which are

responsible for the collection of the charge in cases where incumbents are not continued as collectors. These number at present 1818; but their number will diminish as benefices fall void by death or removal. It has been impossible within our compass to say anything on the vexed matter of the rating of ecclesiastical tithe rent-charge; but Acts in 1899 and 1920 mitigated in some degree the incidence of such, which an eminent legal journal described as 'an anomaly and eccentricity of the law of rating, which is in effect a second income tax, as income is rated locally as well as taxed. Of the £105 stabilised value, tithe-owning incumbents contribute £5 toward the local rates levied on the charge, and ecclesiastical corporations £16, in respect of each £105. The remainder is discharged by the Inland Revenue Board.

See ADVOWSON, TEINDS; works on the history of tithes by Easterby, Edwardes-Jones, Lord Selborne (1886); Phillimore, *Ecclesiastical Law* (new ed. 1895); and on the Tithe Acts, Leach, Millard (1926), and Lord Ernle in the 1892 edition of *Chambers's Encyclopædia*.

Tithing. See FRANK-PLEDGE, HUNDRED.

Tithonus, son of Laomedon, brother of Priam, and spouse of Eos, the goddess of Morn. The story is that Eos, in asking immortality for her spouse, forgot to ask at the same time eternal youth, so that in his old age he became completely shrunk and decrepit, whereby his 'cruel immortality' was rendered a burden to him.

Titian is by many reputed the greatest painter of the world. His life was the longest in the biographies of artists, and it was also one of the most productive, as he worked quickly and energetically, enjoyed almost perfectly regular health, and produced regularly, except when his labours were occasionally interrupted by festivities or by travel. The consequence is that the biography of Titian is one of the most difficult to write laconically. If too much compressed, it would become a mere list of dates. In this brief notice there must be many omissions. It will be divided into three parts, treating separately of the artist's life, his patrons, and his works.

The Anglicised form of the name is obtained by dropping the final *o* from Titiano, which was the artist's most common signature, though he sometimes wrote Tiziano, occasionally Ticiano, and rarely Tician. The English form, therefore, is nearer to the most frequent signature than the French *Titien*. The modern Italians have preferred Tiziano. The painter's contemporaries gave various forms to his name from uncertainty or carelessness, as for instance Tuciano.

Titiano Vecellio was descended from a respectable but not wealthy family. The surname Vecellio or Vecelli appears to have been originally a Christian name, Guecello, but at the time of the painter's birth it was fixed as a surname, and Tiziano afterwards became common in the family. The date of the painter's birth is not quite positively fixed, except that the year is indicated by his own statement on August 1, 1571, that he was then an old man of ninety-five, so he cannot have been born later than 1477. His birthplace was close to the castle of Cadore, in a very mountainous region, and his continued attachment to the country of his birth is proved by his frequent visits to it, and by his numerous sketches of its scenery. Titian's father, Gregorio Vecellio, was a brave officer who filled various important civil functions in his native place, and was greatly respected both for wisdom and valour, but he was a poor gentleman. Gregorio sent his little son to Venice at the age of ten, to the house of an uncle, who saw that he had a turn for art, and sent him to Zuccato, a mosaicist, and afterwards to Gentile Bellini. That painter disapproved of his pupil's rapidity, so the boy (who seems to have enjoyed a good deal of independence for his years) first went to Giovanni Bellini, and afterwards to Giorgione. This is evidence that as a quick and intelligent little boy and an observant youth Titian actually saw the transition from comparatively primitive to advanced art at the moment when it took place, and that he adopted without hesitation for himself what were then the most modern and advanced principles.

The rapidity with which Titian absorbed all that was known at Venice about the art of painting is proved by the simple fact that he produced a masterpiece at twenty-three, and very soon had plenty of employment, both in fresco on public edifices and in oil. In 1511 he was painting fresco at Padua, and in 1516 he made his first visit to Ferrara. There are no events in his life outside of his work till 1524, when he had a fever that prostrated him and threatened to become chronic. The date of Titian's marriage is unknown, but the birth of his eldest son, Pomponio, is believed to have occurred in 1525. All we know is that he had a wife whose name was Cecilia. He contrived, by influence, to obtain ecclesiastical preferment for Pomponio though a mere child, the work being done by a curate. Afterwards he had two other children, Orazio and Lavinia. Pomponio turned out badly; Orazio, a painter, survived Titian a few months; and Lavinia married. Titian's wife died in 1530, to his intense grief. In the year following he went to live in the fields to the north-east of Venice, where he had a large house with a fine garden, probably going down to the water's edge, and a view of the lagoon. The year 1532 is of importance, as Titian became acquainted with the Emperor Charles V., who made him a count palatine, with other titles, a rank which empowered him to appoint notaries and judges, and legitimise the illegitimate offspring of persons beneath baronial rank. He was also made a Knight of the Golden Spur, with insignia, and the *entrée* at court, and his children were all ennobled. In 1536 he went with the Duke of Mantua to greet Charles V. at Asti. In 1543 Titian met Pope Paul III. and Charles V. at Busseto, where he was the guest of Cardinal Farnese. Two years afterwards he visited Rome, where he was welcomed by Paul III., and in 1546 he returned to Venice. His vigour at the age of seventy was proved by a winter journey across the Alps to Augsburg, where he joined the court of Charles V. He returned to the court at Augsburg in 1550, and probably followed it to Innsbruck in 1551. In 1554 the troubles with his son Pomponio reached a climax, and Titian asked to substitute a nephew for him in the sinecure canonry of Medole. An interesting example of the protection of copyright is a patent granted in 1566 by the Council of Ten, recognising Titian's copyright in prints from his own works. The later part of his life was chiefly occupied in working at Venice for Philip II. of Spain. He still retained energy for work, as is proved by his undertaking in 1576 a large picture for the Franciscans. In the same year he died of the plague, at the age of ninety-nine, and was buried with much public honour, and by daylight, in the chapel of the Crucified Saviour at Frari, a striking exception to the usual practice with regard to persons dead of the plague. Titian's son, Orazio, died of the same disease a few months later in a hospital.

Titian was extremely fortunate in his patrons. The Venetian government acted generously towards him, and on the whole with great indulgence, considering his negligence and delays. He had a great love of pensions, privileges, and sine-

cures—though it has been suggested that many of them were more nominal than remunerative—and was always trying to get them for himself or his relations. He was perpetually begging, and his access to great people gave him excellent opportunities. He was patronised by people of the highest rank, including Doges of Venice, reigning Dukes of Ferrara and Mantua, several cardinals, princes, kings, Pope Paul III., and the great Emperor Charles V. All these personages treated Titian with the greatest kindness and consideration, but although a gentleman in his manners, and a courtier in his correspondence, he sometimes, by negligence, tested their patience very severely. His friendship with Charles V. was intimate, and lasted, in spite of distance, until the emperor's death. Titian's character was not comparable in dignity to that of Michelangelo; it was the nature of a polished self-seeking courtier; but he was an affectionate husband and father, an amiable and sociable companion, and a warm friend. There is no evidence that Titian had much learning—his art would not leave time for that; but he had derived a rare and valuable culture from his immense experience of the world.

Titian's works are so numerous that it is impossible to catalogue them here. He was much in request as portrait-painter, and painted most of the great people he knew, several of them repeatedly. His religious pictures are numerous and magnificent, some of them on a large scale, and like other artists of the Renaissance he frequently chose mythological subjects. Some of his finest works are poetical or allegorical. The supreme rank amongst painters is sometimes assigned to Raphael and sometimes to Titian. Raphael's claim to it is in the extreme grace and refinement of his mental conceptions and in the beauty of his style as a draughtsman; Titian's claim is founded more essentially on the pictorial qualities, and especially on the technical excellence of his painting, which combines in a most extraordinary degree the richest surface with the most magnificent colour. These technical qualities were accompanied by much grandeur of conception and nobility of style. The following is a chronological list of some of Titian's most important works.

'Sacred and Profane Love,' about 1500; the 'Pesaro Altarpiece,' at Antwerp, about 1503; 'Doge Marcello,' at the Vatican, 1508; 'Christ of the Tribute-money,' Dresden, 1508; 'The Three Ages,' Ellesmere Collection, 1518; 'Noli me Tangere,' National Gallery, 1518; 'Bacchus and Ariadne,' National Gallery, 1520; 'Titian and his Mistress' (so called), 1523; 'Altarpiece of St Peter Martyr,' 1530, destroyed by fire at Venice in 1867; 'The Rest in Egypt,' Louvre, 1530; 'A Summer Storm,' Buckingham Palace, 1534; 'The Battle of Cadore,' for the council-chamber at Venice, 1537, destroyed by fire in 1577; 'The Farnese Family Picture,' 1545; 'The Danae of Naples,' 1545; 'The Farnese Venus and Adonis,' 1547; portraits of Philip of Spain, 1550; 'Venus and Adonis,' National Gallery, 1554; 'Martyrdom of St Lawrence,' Gesuiti, Venice, 1558; 'Jupiter and Antiope,' Louvre, 1561; a second 'Peter Martyr,' 1567.

Titian is well but not extensively represented in the National Gallery and in the Louvre. Other public collections, such as those of Dresden, Vienna, Madrid, the Escurial, are rich in Titians. His drawings are interesting, especially his numerous pen-sketches, executed in a bold and simple but very expressive style of his own. They afford strong evidence that his lines, which were intended to be vertical, inclined very much to the right. In all his finished works he corrected this tendency with the plummet.

Many biographies of Titian have been written since that of Vasari, but although the materials were in reality abundant, they were scattered till Crowe and Cavalcaselle brought them together for their invaluable work, the *Life and Times of Titian* (1877). Between Vasari and Crowe we have a biography by Ridolfi, condensed by Sir A. Hume in an English edition, published in 1829. A descendant of the Vecelli family, Taddeo Jacobi, collected great wealth of materials for their history; these he transferred to Stefano Ticozzi, who publisned his book in 1817. That of Northcote (2 vols. 1830) and all later ones are founded upon it. See also the monographs by Claude Phillips (1897, 1898), Knackfuss (1897), Gronau (1900; trans. 1904), and Ricketts (1910); Gilbert, *Cadore, or Titian's Country* (1869).

Titicaca, Lake. See Peru, Bolivia.

Titiens, or Tietjens, Teresa, one of the greatest of modern operatic singers. She was born at Hamburg, of Hungarian parents, 18th July 1831, and made her début at Altona in the character of Lucrezia Borgia in 1849, taking at once a very high position on the lyric stage; at Frankfort and Vienna she was even more warmly received; and her first appearance in London in 1858 was quite a triumph. Among her most famous impersonations were Norma, Semiramide, Fidelio, Margarita, and Ortrud (in *Lohengrin*). She visited America in 1875. The great volume and purity of her voice, and her energetic but dignified acting, combined to make her an unrivalled representative of strong dramatic parts. She was almost equally admirable in oratorio: Sir Julius Benedict wrote *St Cecilia* and other works specially for her. She sang for the last time in public in May 1877 in *Il Trovatore*, and died 3d October of the same year.

Titlark. See Pipit.

Title-deeds are the evidences of ownership of real property. Each owner is supposed to be in possession of his own, either by himself or his solicitors; and the ownership of the title-deeds passes along with that of the lands themselves. See Registration.

Titles, designations to which certain persons are legally entitled, in consequence of possessing particular dignities or offices; see Address (Forms of), Precedence, Majesty, Royal Family, Duke, Marquis, &c.; also Courtesy Titles. Though several foreign countries have their dukes marquises, counts, viscounts, and barons, these often differ considerably in rank from the seemingly corresponding titles in Britain, and the English rules and practices regarding title are not applicable abroad. The complicated system of titles by law, and still more by courtesy, which prevails in England is a source of endless perplexity to such foreigners as endeavour to make themselves acquainted with British usages. For a title to Orders, see Orders (Holy); and for the subject of titles generally, see Edward Solly's *Index of Hereditary Titles of Honour* (Index Soc. 1879).

Titmouse. See Tit.

Titular, one who enjoys the bare title of an office, without the actual possession of that office. Thus, the English kings styled themselves kings of France from the time of Henry IV. down to 1800. In English Ecclesiastical Law a titular is a person invested with a title in virtue of which he holds a benefice, whether he performs its duties or not. In Scotland the term was used by laymen invested at the Reformation with church lands; see Teinds. Leo XIII. altered to 'titular bishops' the old title of bishops *In Partibus Infidelium* (q.v.).

Titus, the Roman prænomen but the usual name for the eleventh of the twelve Cæsars, Titus Flavius Sabinus Vespasianus, the eldest son of Vespasian and Flavia Domitilla, born at Rome, 30th December 40 A.D. He was brought up at the court of Nero along with Britannicus, and early

served with credit as tribune in Germany and Britain, and in Judæa under his father. On Vespasian's elevation to the throne Titus was left to prosecute the Jewish war, which he brought to a close by the capture of Jerusalem after a long siege (70). Both father and son enjoyed a joint triumph in 71. About this time Titus received the title of Cæsar, and took a share in the work of government. He gave himself up to pleasure, and his attachment to Berenice, the daughter of Herod Agrippa I., grievously offended the Romans. But no sooner had Titus assumed the weight of undivided power (79) than his whole character became changed. The very first act of his reign was to put a stop to all prosecutions for *læsa majestas*, and to decree heavy punishments against informers. He assumed the office of Pontifex Maximus in order to keep his hands free from blood. He completed the Colosseum and built the baths which bear his name, and lavished his beneficence upon the sufferers from the great eruption of Vesuvius, which overwhelmed Herculaneum and Pompeii (79), and the great three days' fire at Rome, followed by pestilence the year after. Titus was now the idol of his subjects, the 'love and delight of mankind.' He loved to give, and the characteristic story is told that one night he exclaimed 'I have lost a day' when he remembered that he had given nothing away that day. But unhappily he died suddenly at his patrimonial villa in the Sabine country (September 13, 81), not without the suspicion that he had been poisoned by his younger brother Domitian.

Titus, one of the companions of the apostle Paul, is (apart from the epistle with which his name is associated) mentioned only in 2 Cor. and Gal. He was a Greek, and remained uncircumcised after his conversion. He accompanied the apostle from Antioch to Jerusalem, where the latter took part in the church council held to discuss the Christian privileges of Gentiles. He was thrice sent to Corinth: on the first occasion, from Ephesus, as bearer of a no longer extant epistle (2 Cor. ii. 3, 4; vii. 8, 12); afterwards, from Macedonia, with the second canonical epistle; and a third time to promote the collection in Corinth for the poor Christians of Judæa. According to Tit. i. 5 he accompanied the apostle to Crete, and was left by him there. Ecclesiastical tradition makes Titus 'bishop' of Crete. For the canonical epistle to Titus, and works thereon, see TIMOTHY AND TITUS (EPISTLES TO).

Titusville, a city of Pennsylvania, on Oil Creek, 120 miles by rail SSW. of Buffalo. It contains oil wells and refineries, and, though it possesses also iron and steel works, &c., its prosperity is mainly dependent on the oil-trade. In June 1892 it suffered much from a great flood. Pop. 8000.

Tiumen, a town and important commercial centre of western Siberia, 90 miles SW. of Tobolsk, on the Tura, an affluent of the Tobol, and so of the Irtish and Obi. Connected by rail with Perm and the Russian system, it is on several important trade routes both by land and water; and large quantities of leather, carpets, soap, candles, and pottery are manufactured and exported throughout Siberia, the Ural countries, the Kirghiz Steppes, Khokand, Bokhara, and China. It has a large scientific and technical school, and there is a great fair in January. Tiumen contained an important exile forwarding prison (see books cited at SIBERIA). Pop. 44,000.

Tiverton, a municipal borough of Devonshire, 14½ miles N. by E. of Exeter, stands pleasantly on an eminence between the confluent Exe and Loman, and got the name *Twy-ford-ton* from two fords upon those two rivers. Little save the gateway remains of the castle of the Earls of Devon, built in 1106, and dismantled after its capture by Fairfax in 1645. St Peter's, a Perpendicular church of the 15th century, was mostly rebuilt in 1855; and other edifices are the town-hall (1864), late Venetian in style, with a tower 80 feet high, the market-house (1830), the infirmary (1852), the Greenway almshouses (1517), Waldron's almshouses (1579), and the grammar-school (1604), which was founded by Peter Blundell (1520–1601), and has an endowment of £1100 a year. Among its scholars have been Bishops Bull, Hayter, Conybeare, Archbishop Temple, A. Hayward, R. D. Blackmore, and his hero, John Ridd. New school buildings in the Tudor style were erected in 1880. Tiverton was a great seat of the woollen trade from 1353 till 1700 and afterwards, but lace-making is now its staple industry, the lace-factory having been established in 1816 by John Heathcoat (1783–1861), inventor of the bobbin-net frame. Cosway, the painter, and Mrs Cowley, dramatist, were natives; whilst Lord Palmerston for thirty years (1835–65) represented Tiverton, which was chartered by James I., but lost its two members in 1885. Pop. (1851) 11,144; (1871) 10,025; (1911) 10,205; (1921) 9715. See works by M. Dunsford (1790), W. Harding (2 vols. 1844–47), and F. J. Snell (1893).

Tivoli (the ancient *Tibur*), a town and episcopal see of Central Italy, 18 miles E. of Rome by steam tramway (which follows the highroad) and 25 by rail. Tibur was certainly a city of considerable power in early days, though there is no reliable information as to its foundation. It did not lose its independence, wisely becoming an ally of Rome; and it possessed a great sanctuary of Hercules, which (like the temple of Fortune at Palestrina) extended up the slope of the hill on which the mediæval town (which contains some interesting old churches and houses) is built. In the Augustan age the imperial house shared these divine honours. There are considerable remains of this sanctuary; but the two famous temples of Tivoli (one round, one rectangular), above the old waterfall, are of uncertain attribution. In the late republican period and under the empire Tivoli was a favourite resort of wealthy Romans, and on the hills near the town are a very large number of ruins of Roman villas. Horace, his friend Quintilius Varus, Mæcenas, and Augustus himself, and many others had villas here, though only those of the first two can be identified with any certainty, and the traditional names are generally misleading. In low ground below the town is the vast villa of Hadrian, most magnificent of any of the villas: it has produced a very large number of sculptures and other works of art, which now adorn the various museums of Europe: its structural remains are of great interest; they have been for the most part excavated, and are in the hands of the government. The famous Villa d'Este, begun by Pirro Ligorio in 1549, is built on terraces on the ancient principle; it was decorated with numerous fountains and adorned with classical sculptures (now dispersed among other collections), but is probably far more beautiful in its picturesque decay. The waterfalls of Tivoli were gradually eating back the cliff and threatening the town with destruction; two new tunnels were therefore built in 1826–35, and the new fall (Cascata Grande) formed. The smaller falls (Cascatelle) pass through the town, and furnish power for paper and rag mills, and for the first power-station (1892) for electric lighting and trams in Rome itself, now supplemented by others farther up the Anio valley and as far away as Terni. The territory of Tivoli is very fertile. Vines, fruit-trees, and olives flourish; the last attain a great age, and add to the beauty of the

landscape. The magnificent view across the Campagna to Rome and the sea is not the least of the attractions of the place. Pop. (1921) 16,387.

Tlaxcala, the smallest state of Mexico, on the plateau of Anahuac, nearly surrounded by Puebla, and touching Mexico state on the west. In Aztec days Tlaxcala was the seat of an independent republic, which survived for a time under the protection of the Spaniards. Area, 1506 sq. m.; pop. 200,000. The capital, Tlaxcala, stands 7300 feet above the sea, and has some manufactures of woollens; pop. 5000.

Tlemcen', a town of Algeria, 80 miles SW. of Oran, stands on a rock in an undulating country, with a delightful climate, and surrounded by olive-plantations and vineyards. Pop. (1926) 26,758.

Toad (*Bufo*), a genus of tailless Amphibians (Anura), marked by the absence of teeth on the jaws, a very glandular skin, usually warty, a pear-shaped protrusible tongue, fixed in front and free behind. The genus is represented all over the world except in Australia and Madagascar. The Common Toad (*Bufo vulgaris*), whose range extends over Europe except in the south, and over Asia north of the Indian region, may be distinguished from the common frog by its warty gray-brown skin, by having no teeth on the jaws, by its less-developed web between the toes, by its crawling and climbing instead of jumping, by being more terrestrial, by its nocturnal habits, by laying its eggs in strings, not in clumps, and in many other ways. But all the species of Bufo are not like the common toad; thus the African Jerboa toad has long slender legs. Moreover, some burrowing frogs are very toad-like.

The common toad shows many colour-varieties, and an individual can change colour considerably according to its moods and haunts, the inciting influence being apparently a hormone from the

1. Common Toad (*Bufo vulgaris*); 2. Natterjack (*Bufo calamita*).

pituitary body. This chemical messenger is carried by the blood to the colour-cells or chromatophores of the skin, which contract or expand. In many cases the colour is olive-gray to dark brown above, with whitish underparts which often show a brown, yellow, or reddish tinge. The eyes are peculiarly fine, with a red or coppery iris. In its movements the toad is rather slow, usually crawling, occasionally taking a short hop; it can climb well on a steep bank, and some of its relatives are arboreal. At the breeding time it swims strongly. It shoots out its tongue on an insect, and the fingers are used to poke a gripped earthworm or the moulted outermost layer of skin into the mouth. The moulting takes places every few weeks in summer. The toad hides in holes during the day, and comes out at dusk to hunt for insects, earthworms, and small slugs. In winter it passes into a state of coma, buried in loose dry earth or in the midst of withered leaves, perhaps in the hollow stump of a tree.

The pairing takes place in early spring, often about the beginning of April, and the toads have often to make a considerable journey to find a suitable pool. The ardent males, who are far more numerous than the females, fight with one another for possession, and are very prolonged in their sexual embrace. Their cry has been compared to 'the distant barking of a little dog,' while the female's weak response, which goes on day and night, has been likened to 'the whining bleating of a lamb.' The eggs, which may number 2000–7000, are laid in two double strings of albumen, sometimes ten feet long. The eggs are fertilised externally by the male, just as they pass out from the female; and the long strings are entangled among water-plants by the movements of the coupled pair. In about three weeks the tadpoles emerge from the albuminous jelly, and their life-history is much the same as in the case of frogs. In about three months the tadpoles have become miniature toads, about three-quarters of an inch in length, and more agile than their parents. They hide among grass and in little holes in the ground, and the sudden appearance of large numbers when rain comes after prolonged drought has given rise to stories about 'showers of toads.'

Many misunderstandings have clustered round the toad. Thus it is said to be 'a slimy creature spitting venom,' but it is rather dry-skinned, and it cannot spit. The glands, called parotoid, that are seen as prominent swellings behind the eye, as well as smaller glands distributed over the skin, secrete a volatile poison (phrynin) that inflames the lips and mouth of any animal that tackles a toad. This greatly reduces the number of the toad's enemies. Other qualities that secure survival are its quiet and elusive ways, its crepuscular activities, and its capacity for lying low without food in the winter. The toad is not an animal of much intelligence, but it is tameable, and seems to be able to recognise its keeper.

The other British toad, the Natterjack (*Bufo calamita*) is a much smaller animal with large vocal sacs, a very loud croak, prominent yellow eyes, and handsome colouring. Its hind-legs are so short that it cannot hop at all, but it can walk or even run at a fair speed. Unlike the common toad, it occurs in Ireland (on the coast at Dingle Bay), as well as in Great Britain, but it is not a common animal. It has a very distinct odour. Among the other toads may be mentioned the North American *Bufo lentiginosus*, the South American giant *Bufo marinus*, which is often six inches long, the European Green Toad (*B. viridis*), and the beautiful Pantherine Toad (*B. mauretanicus*) of Africa. See Hans Gadow, 'Amphibia and Reptiles,' vol. viii. of *Cambridge Natural History* (1901).

Toadflax (*Linaria*), a genus of plants of the family Scrophulariaceæ, very closely allied to Snapdragon (q.v.), from which genus it is distinguished chiefly by the spur at the base of the corolla, and the capsule opening by valves or teeth, not by pores. The species are herbaceous perennials or annuals, natives chiefly of the colder and temperate parts of the Old World. Some of them are natives of Britain, of which the most common is *L. vulgaris*, a species with erect stem 1 to 3 feet high, glaucous linear-lanceolate leaves which thickly cover the stem, and terminal spikes of yellow flowers. It grows in hedges, the borders

of cornfields, &c. It possesses purgative and diuretic properties, and a decoction of it is used as a fly-poison; but it is regarded as a troublesome weed by farmers. It has found its way, probably along with grain or other grass seeds, into the United States. A very remarkable monstrosity is sometimes seen in this plant, to which the name *Peloria* has been given, the flower presenting five spurs and five usually imperfect stamens. *L. Cymbalaria*, the Ivy-leaved Toadflax, or the Mother of Thousands, a favourite window-plant with cottagers, known to Gerard as a garden flower, escaped from the Physic Garden at Chelsea, and is now quite naturalised on old walls in Britain.

Toadstool, a name for almost any large umbrella-shaped Fungus, but as a rule understood to refer to a poisonous form as distinguished from a Mushroom (q.v.). See FUNGI.

Toast (Late Lat. *tosta*, 'a piece of toast,' from *tostus*, 'scorched' or 'parched') is the name given to bread dried and browned before the fire. So early as the 16th century toasted bread formed a favourite addition to English drinks. Sack was drunk with toast, and so was punch. The practice of drinking healths, particularly that of an entertainer, is one so natural, so likely to spring up spontaneously, that it is impossible to say when it began. Certain it is, however, that it received an artificial development owing to the prevalence of convivial habits in the 17th century. Then it became the fashion to drink not to the health of entertainers only, but to that of each guest, of absent friends, and more especially of the unmarried woman whose attractions were most generally acknowledged. It also became the custom to describe a woman whose health was so drunk as herself 'a toast'—a custom whimsically referred to one particular incident in the *Tatler*, No. 24 (1709). Whatever may be the origin of the use of the word 'toast' in this sense, we now apply it not only to any person, but to any sentiment mentioned with honour before drinking. Both French and Germans have adopted the word from us. See Chambers's *Book of Days;* Valpy's *History of Toasting* (1881); lists of toasts and sentiments in *Notes and Queries* for 1888; A. Gray's *Toasts and Tributes* (1904); *Prosit* (San Francisco, 1904); and Chase and French's *Waes Hael* (1904).

Tobacco is a name believed to have been derived from *tabaco* or *tabac*, the Haytian or Carib name of the instrument in which the leaves were smoked by the natives. The plant belongs to the genus Nicotiana, family Solanaceæ. The various species are mostly herbaceous, rarely shrubby, generally with large broad leaves, and covered all over with small clammy hairs. There are said to be in all about fifty species of the plant, with many varieties belonging to each, but of these three stand out in importance apart from the rest. The first of them is *Nicotiana Tabacum*, or American tobacco, which furnishes the bulk of the tobacco of commerce. It is a handsome plant, standing sometimes 6 or 7 feet high, with large oblong leaves which embrace the stem at their base, and with a pink or rose-coloured flower. It is now grown in all parts of the world, and the commercial American tobacco is almost exclusively of this species, although the varieties differ so widely as sometimes to give rise to a doubt whether they are not of different species. It includes, amongst other kinds, the famous Virginian, Kentucky, Maryland, and Havana tobaccos.

N. rustica is a smaller plant, about 3 or 4 feet in height, with leaves of a more ovate form which are attached to the stem by stalks, and with a green flower. It is a native of America, but is now cultivated chiefly in Europe, Asia, and Africa, and furnishes the Turkish, Syrian, and probably the Latakia tobaccos of commerce. It is a hardy plant, and ripens earlier than *N. Tabacum*. It is called green tobacco, because the leaves in drying do not entirely change to brown.

N. persica, which furnishes the famous mild Shiraz tobacco is grown in Persia, and has oblong stem-leaves and a white flower. *N. finis*, popular in the private gardens of England, is often a long straggling plant with small leaves widely separated, but by continually nipping the stem it may be made to assume a bushy form. The flower is white and droops somewhat during the day, but towards sunset it opens out, becomes firm, and then emits for the remainder of the evening a powerful and delicious perfume, which is, of course, quite unlike that of prepared tobacco.

Fig. 1.—American Tobacco (*Nicotiana Tabacum*).

History.—It is a matter of conjecture whether the use of tobacco as a narcotic was known in the East before the discovery of America. It is believed that it was long cultivated in New Guinea before Europeans found their way there. It is possible that the Chinese had long been accustomed to smoking it. The habit, however, did not spread to surrounding countries; whereas on the introduction of tobacco into Europe from America its use rapidly extended and soon became very prevalent in Oriental countries. The custom was in full force in America when that continent was first discovered by Columbus. The natives of the West Indies at that time made the tobacco into cylindrical rolls wrapped in maize-leaf.

Fig. 2.—Syrian Tobacco (*Nicotiana rustica*).

Fra Romano Pane, whom Columbus had left behind in Hayti, in 1496 wrote Peter Martyr an account of tobacco; but an exact description of the plant was first given in 1525 by Gonzalo Hernandez de Oviedo, viceroy of San Domingo, who also introduced it into Europe, and cultivated it as an ornamental plant in Spain. Its medicinal properties caused its cultivation to spread to other European countries. Jean Nicot, French ambas-

sador at Lisbon, purchased some seed there which had just been brought over from Florida, and sent some of it home. In 1561, upon his return, he presented some of the plants to Catharine de' Medici. Various names were given to the plant at this time, but finally it was designated *Nicotiana*, and this word, which has been retained by botanists, gives rise to Nicotine, the name of the characteristic alkaloid of the plant. The custom of smoking the dried leaves quickly succeeded the cultivation, to be followed soon after by the habit of snuffing—luxuries at first confined to the wealthy. Therewith commenced a literary warfare, not yet ended, in which the vituperators of the 'stinking habit' produced most of the writings. Popes Urban VIII. and Innocent XI. issued decrees. Sultans of Turkey made smoking a crime punishable by the offenders having their pipes thrust through their noses. In Russia the noses of smokers were cut off. Into England tobacco was, according to some, first brought by Sir John Hawkins in or about 1565. Probably Sir Walter Raleigh had much to do with its popularity by encouraging its growth in 1586, but he was not the introducer; nor was Ralph Lane of the Virginia expedition of 1585, though he too may have helped to spread the habit of 'drinking' or 'taking' tobacco, as it was called. We read in Lobel's *Stirpium Adversaria Nova* (Lond. 1571) that tobacco was at that time successfully cultivated in England and Scotland.

Shakespeare makes no reference to the use of tobacco, but many passages could be culled from Ben Jonson, Dekker, and the other dramatists. Bobadill in *Every Man in his Humour* (III. v.) professes to have received in the Indies 'no other nutriment in the world for the space of one and twenty weeks but the fume of this simple only. Therefore it cannot be but 'tis most divine.' 'Divine' is Spenser's word also (*Faerie Queene*, III. v. 32), and was, indeed, the stock epithet among those who approved of its virtues whether for the healing of wounds or 'the expulsion of rheums, raw humours, crudities, obstructions, with a thousand of this kind,' or for closing 'the orifice of the stomach' when one cannot come by a dinner. We hear the other side from Cob in the same scene, from the Citizen's Wife in *The Knight of the Burning Pestle* (I. ii.), and from Clare in *Westward Hoe* (V. i.). 'Filthy,' 'roguish,' and 'stinking' are the favourite adjectives; and much is made of the deadly soot with which the tobacco-drinker's body is choked. Smoking was at this time a mark of the man of fashion, and was surrounded with a ceremony and a special jargon like fencing or heraldry. In *Every Man out of his Humour* (III. i.), Sogliardo, who wishes to be a 'gentleman,' is instructed in the mysteries by Master Shift, who professes to teach his pupil 'to know all the delicate sweet forms for the assumption of it; as also the rare corollary and practice of the Cuban ebolition, the Euripus, and whiff, which he shall receive or take in here at London and evaporate at Uxbridge or farther if it please him.' In the early days of smoking, when the price of tobacco was high, it was usual to expel the smoke through the nostrils, as is still the custom of some cigarette-smokers. Sogliardo even uses a 'poking-stick' to widen his nostrils.

The first book against tobacco seems to have been *Opinions of the late and best Phisitions concerning Tobacco* (1595), followed in 1602 by *Work for Chimney Sweepers*. In the latter year came *A Defence of Tobacco*, and in 1604 the famous *Counterblaste to Tobacco* of James I., in which that monarch expressed his disapproval of smoking in the following terms: 'A custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and in the black, stinking fume thereof nearest resembling the horrible Stygian smoke of the pit that is bottomless.' In 1614 the Star-chamber imposed a tax on tobacco, and at about this time stipulations began to appear in respect to responsible appointments, one of the necessary qualifications of a teacher being that he should be 'no puffer of tobacco.' All this proved of little or no avail, and plantations sprang up in all parts of the country. Under Charles I. denunciations continued. Charles II. placed a duty on imported tobacco and forbade cultivation.

Cigar-smoking, though practised by the Indians and Spaniards, was rare in northern Europe. The first cigar-shop in Germany was opened in Hamburg in 1788. French soldiers brought the habit from Spain early in the 19th century. Cigarette-smoking was brought to Britain by the soldiers who fought in the Crimean war, but Ruskin denounced it as 'enabling a man to do nothing without being ashamed of himself.' In the United States the use of chewing-gum has partly superseded that of tobacco.

Cultivation.—Although the tobacco-plant is essentially a tropical one, it readily acclimatises itself to temperate regions, and the hardier kinds can be easily cultivated in comparatively cold climates; but the produce is less valuable the farther north we go, and in some countries, as in Germany, tobacco deteriorates if continually grown from its own seed. Unquestionably the best varieties are those of the tropical countries. One of the most remarkable characteristics of the plant is its rapacious appetite for mineral constituents or what ultimately becomes the ash; and it very soon drains the soil of all its nourishing food. The plant is not over particular as to the quality of the mineral constituents, which, nevertheless, materially affect the quality of the leaf. For instance, if salt is employed as a fertiliser the plant will take up enormous quantities of its chlorine—an element with which it can do without almost entirely—and will be ruined by this as regards its burning properties. Then again, a lime soil will produce a large crop, but the general quality will be somewhat impaired by it. The size of the leaf or the fullness of the crop is no guarantee that that crop will produce a good tobacco. The best kind of soil is an alluvial or a light sandy one containing plenty of potash. In America it is found that on new land the plant has larger stems and fibres than on old, the leaves have a coarse texture, and the tobacco a strong acrid taste, although at the same time the yield is larger. Generally speaking, old soil is preferred, not only because it produces a sweeter tobacco, but because it is more easily prepared. The soil should be watched and deficiencies made good. Potash should be present in larger quantity than is necessary for ordinary agriculture, and when deficient should be added in the form of sulphate. In growing the small garden plant the ash of smoked tobacco may be advantageously used by throwing it on the adjacent mould.

The details of the cultivation vary of necessity according to the climate and the country in which it is carried on, but the following is a general description of what usually takes place. The seed-bed, which should be a light friable soil, is well broken up to a depth of 1½ foot some months before sowing. A drain is dug round it after the style of an asparagus-bed, and a brush heap is burned over the ground to kill weeds and supply potash. The seed, which is very small (one ounce containing about 100,000), is mixed with wood-ashes or sand to assist in its even distribution, and is sown in America between the middle of March and the early part of April. About half an ounce of seed is usually required to produce

plants necessary for an acre. In cold climates the seeds are sown in hotbeds. When the seed has been sown the bed is covered first with a thin layer of manure, then with a sprinkling of ashes to keep off ants, and finally with cut straw and small branches of trees to protect the seedlings from cold. In India protection from sun and rain is necessary. The soil is kept moist but not wet, and the plants, which appear in about a week, require frequent but gentle watering. They are thinned out after two or three weeks, and in about seven or eight they are transplanted into the fields. The field is prepared by several ploughings, and by being ridged or raised into hillocks about 2 or 3 feet apart. These ridges or hillocks are flattened at the top and the seedlings planted in small hollows on them, one seedling to each hillock, or, in the case of the ridges, about 3 feet apart. If the weather is dry the plants should be watered night and morning. They rapidly shoot up, and are then watched carefully for insects—in some parts a flock of turkeys being kept for this purpose. When the flower begins to shoot it is nipped off, so that it shall not take away from the leaves any of the nutriment of the plant. This 'topping' is not done in Turkey and some eastern countries where small leaves are required, and where leaves, buds, and flowers are all used. Generally the leaves are classified into three sorts—the strongest nearest the roots, the medium in the middle of the plant, and the mild at the top. The number and the quality of the leaves may be regulated by nipping off the stem at any desired stage of its growth. Thus a plant may be made to yield eight or ten leaves of a strong flavour, a few more than this of a medium strength, or a still larger number of a mild kind. After the plant has been nipped 'suckers' begin to appear, and must be removed as quickly and as completely as possible. This, together with the removal of worms, can only be adequately performed by a daily examination. Nothing else is now required to be done until the leaves are sufficiently ripe for the harvest, which generally takes place in August or the early part of September. In some places a uniform quality of leaves is aimed at by first cutting a few of them nearest the roots, then leaving the plant eight or ten days for the other leaves to strengthen, cutting a few more of the lower ones, and so on, until the stem is stripped. Another plan is to bring down the whole plant at once by cutting the stem close to the ground.

In India, Ceylon, and some other eastern countries the leaves are simply sun-dried and sent into the market, while in Europe artificial drying is resorted to in the shape of drying-houses heated generally to a temperature of about 70° to 90° F. In America both natural and artificial methods are adopted, nearly always conjointly. Sometimes the leaves are hung in sheds till the spring and then bulked, but more often they are dried in the drying-house, after perhaps being partly sun-dried, then placed in heaps, covered over, and left for a week or two to ferment, with occasional turning to prevent excessive fermentation and firing. The leaves are then sorted, tied into bundles of about a dozen, called 'hands,' and packed under pressure in barrels or hogsheads.

Manufacture.—Tobacco may be selected on account of its colour, its aroma, its body, or its drinking power—i.e. its power of absorbing and retaining water without becoming too wet, a very useful kind of tobacco to some manufacturers in past years. Again, it may be chosen as a fiery tobacco which is used to mix with other kinds difficult of burning, while a material like Chinese tobacco, which is of a very light yellow colour, without body and almost flavourless, is bought solely for producing variety of colour in mixtures. Leaves for cigar-making must be of a good colour and fair body, possess a pleasant aroma to begin with, emit an agreeable odour on burning, have a fairly fine texture, a certain amount of toughness, the ribs and veins must be small, and finally, they must answer the burning test, which is that the leaves should continue to smoulder after they have once been lighted.

Tobacco is imported always tightly compressed and apparently quite dry and crisp. Sometimes it is in the full leaf in bundles tied round by one of its own leaves; sometimes the midribs have been removed—when the material is then known as 'strips.' American varieties are exported in these conditions roughly and tightly packed in hogsheads. The more tender kinds, such as Turkish, Chinese, and Ceylon, are carefully packed leaf upon leaf. The names of some of the better known varieties in the market are those of Virginia, Kentucky, Maryland, Big Frederick, Western (leaf and strips), Indiana, &c. from America; Java, Japan, China, India, and Ceylon from the East; and Turkish and German from Europe. The dry-looking imported article contains from 10 to 20 per cent. of water, or on an average about 14 per cent.; but before manufacture it must be impregnated with more water and steamed, when the leaves rapidly become flaccid and easily open out.

In the manufacture of cigars the leaves, after being thus treated, are stripped of their midribs, smoothed and sorted, the perfect half-leaves being put on one side to be used as wrappers. One of these strips is cut into the shape of a balloon gore, and fragments of imperfect leaves and cuttings, known as the 'fillers,' being placed at one end, the strip is wrapped round them. Over this is then wound spirally a long narrow rectangular slip called the 'wrapper,' commencing at the lighting end and finishing at the pointed or mouth end. The cigars are then gauged and cut to length, dried and packed. Cheroots differ from cigars only in the matter of shape, being open at both ends, generally with one of them much broader than the other. Good cigars should consist of the same tobacco throughout, but very often the seductive wrapper conceals an inferior and even bad material. Cigars are rarely adulterated; the interior is at worst nearly always tobacco of a cheap kind. The best Havana cigars all come from Cuba; but it is a common practice to place home-made cigars in imitation foreign boxes. Cheroots come chiefly from the Philippine Islands. Mexican tobacco has met with much favour of recent years for cigar-making. The high import duty for cigars has fostered the practice of importing the leaves, on which less duty is paid, and manufacturing them in England. The difference between the foreign and British made articles is easily detected, and, as a rule, the latter are more glossy, better made, and more uniform in their appearance than the former. In the United States cigar-making is an important industry, and the best brands of 'domestics' bring a good price. Cigarettes, at first made only by hand, as they are often still, are now made mechanically by various methods. The machine may wrap the paper round the tobacco and gum it up; or it may first make a paper tube, and force the tobacco in.

The greater portion of the imported leaves, however, is manufactured into pipe tobacco, of which there are two classes—the *cut* and the *cake* or *twist*. As a rule, for the former class the leaves are stripped of the midrib, damped, allowed to ferment a little, and are then placed in a square iron box and pressed into a large cake. The dark-coloured liquor which is squeezed out is used as 'sauce' for a stronger product. The cake is then cut in a

cutting machine into shreds of the desired fineness. The cuttings are gently steamed, pulled, well mixed, and scented if desired. *Shag* is prepared in this way from a rather strong variety of leaf. In the case of *Bird's-eye* the midribs are not removed. *Returns* is so called from being prepared from broken and rejected pieces and siftings.

In the second class there are also many kinds, such as *Cavendish*, *Negrohead*, *Pigtail*, *Bogie*, &c. The strongest kinds of leaf are employed in their preparation, and generally plenty of sauce is mixed in. For *Cavendish* the leaves are stripped, sauced, fermented, and are then laid one upon another and pressed into cakes of the desired size. They are sometimes made into sticks about 9 inches long and 1 inch thick, which are then laid across each other equally and pressed together: this kind is called *Negrohead*. In the case of twist tobacco the stripped fermented leaves are twisted either by hand or by a spinning-wheel after the style of making string. The rope so obtained, if thin, is known as *Pigtail*, and if thick, generally as *Bogie*. It is wound into balls or reels. All these kinds are oiled with sweet-oil, which prevents them from sticking together and from becoming too dry. In America mild cakes are impregnated with molasses or liquorice to give them a sweet flavour in chewing, but in England the sale of such tobacco is illegal. Cigarettes are usually made of the Syrian species, such as fine-cut Turkish, Salonica, &c.; but American tobacco has of late years been rather extensively used.

When the British duty on tobacco was reduced in 1887 there was a limit placed on the amount of water to be allowed in the manufactured article. The adulterants of tobacco are legion. All kinds of vegetable substances, gums, saccharin, and mineral matters have at different times been detected. Manufacturers in Britain are prohibited, under a penalty of £200, not only from using but from having in their possession sugar, honey, molasses, treacle, leaves, herbs, or plants, powdered wood, weeds, ground or unground, roasted grain, chicory, lime, sand, umber, ochre, or anything capable of being used to increase the weight of tobacco and snuff.

Snuff used to be made from tobacco leaves, but now it is prepared almost entirely from the stalks and ribs which are not used by the tobacco-manufacturer. The dry snuffs include the well-known Welsh, Scotch, and Irish varieties, and are prepared by finely grinding the stalks in a mortar after they have been allowed to ferment. The characteristic odour of the Irish and Welsh kinds is obtained by gently roasting the stalks previous to grinding. The moist snuffs include most of the preparations with fanciful names. These are generally made by grinding the stalks wet, allowing the fermentation to take place after grinding, mixing with various salts sanctioned by the excise, scenting and moistening to the desired degree. Snuff has been, and is sometimes now, adulterated to an enormous extent. It is no uncommon thing at the present day for the tobacco-manufacturer to add the sweepings of his whole factory to the parcel of scrap pieces intended for the snuff-maker. Besides this, many adulterants are purposely added, including many kinds of vegetable matter, salts, red-lead, chromate of lead, and oxide of iron.

Constituents.—The green leaf, and even the bulk of the dry imported leaf, contains a large ratio of complex organic bodies which retard combustion, and which, on forcing the burning, give off very objectionable odours. It is the processes of curing, fermenting, and manufacturing which get rid of or modify these objectionable bodies, and so render the material fit for use. Excessive fermentation has to be avoided, especially with cigar tobacco, because it blackens the leaves and produces ammonia compounds. Some leaves, especially those grown in tropical climates, do not require fermentation. The mineral constituents remain the same throughout, except in their combination with the organic substances, and on burning they constitute the incombustible residue or ash. The ash should be white or grayish white in colour, and not excessive in quantity—generally between 12 and 20 per cent. of the dry leaf; redness denotes iron in the soil, and blackness is due to carbon, the result of imperfect combustion. The characteristic constituent, however, of all tobacco is the alkaloid *nicotine*, which varies in quantity from about 1 to 9 per cent. The best flavoured kinds, such as Havana and Manilla, contain only about 2 to 3 per cent., while some of the commoner varieties of French and German run up to 9 per cent. American Virginia and Kentucky average about 4 or 5 per cent. It is believed by many that the spotted appearance is a good indication. The origin of these spots has given rise to many opinions; but it is now understood that the pale spots are formed by the sun's heat being concentrated by transparent globules on to the leaf and locally burning.

Consumption and Use.—The consumption of tobacco at the present time is greater than it ever was. Thus the annual consumption per head of population in England was 11·7 oz. in 1821, 16·3 oz. in 1851, 23·3 oz. in 1881, and 30·2 oz. in 1901. By 1918 it had grown to about 2½ lb. The average for the whole of Europe in 1892 was calculated at 2¼ lb. for each inhabitant, which is of course 3 oz. per month. A large quantity of tobacco used to be disposed of as snuff, but the habit of snuffing has decreased very rapidly, and 'plugging' or stuffing the nostrils with quids of tobacco has died out altogether. Chewing is now practised by Englishmen chiefly as a consequence of restrictions placed upon smoking, as, for instance, by sailors at sea and by workmen during working hours; it is comparatively common in the United States.

Commerce.—The revenue of Great Britain from the import duty on tobacco in 1891 constituted for the first time more than half the whole revenue of the customs department. In 1925–26, out of £103,300,000 of customs receipts, some £53,500,000 came from tobacco. This is, of course, because it is taxed so enormously out of proportion to its own value, and so much more heavily than the other articles. The disproportionate tax naturally offers a strong temptation for surreptitious trading or Smuggling (q.v.). The authorities keep up a rigorous supervision to prevent it.

Most of the world's tobacco comes from the United States. Other countries in which it is grown are Cuba, Mexico, Egypt, Syria, Macedonia, Asia Minor, India, Japan, China, and the Dutch Indies. Cigars are chiefly brought from the West Indies, Philippine Islands, Germany, and Mexico.

Physiological Effects.—Tobacco acts in various ways on the system, depending, first, on the individual, and, secondly, on the time and circumstances of its being consumed. It acts most frequently as a sedative or a narcotic. In some instances it will rouse the sluggish mind into activity, while in others it will moderate excessive mental excitement. It will often correct the disagreeable effects of nervousness; while, on the other hand, it will likewise act as a laxative. The most noticeable characteristics perhaps are the effects of smoking on the nervous system in such cases as those in which it is upset by mental distress or anxiety. At the same time it must not be forgotten that there are persons whose nerves are disarranged and quite upset by smoking. By such people the habit should be tabued altogether.

Others again are only inconvenienced after an excess, while there are those who can stand any amount. Consequently, if the use of tobacco is ever to be governed by a single law, it will be by that of common-sense. The amount to be consumed must be regulated by the individual who consumes it. Although even excess has never been known to originate a specific disease, still it reduces the system to a low condition, and unfits it to fight against ailments brought on by other causes. Until the system is near maturity, tobacco should be only lightly indulged in, or avoided *in toto*, as it acts prejudicially, even in small doses, in early life, and if used in excess is liable to have a permanent ill effect. The immediate effects of tobacco-poisoning are very transitory, and they soon work off.

The usual effects of an overdose of tobacco are faintness, nausea, giddiness, general relaxation of the muscular system, loss of power of the limbs, cold perspiration, and vomiting. In some cases there is purging, and in others a sense of sinking or depression in the region of the heart. Attendant on these symptoms are a dilatation of the pupils, dimness of sight, weak pulse, and difficulty of breathing. In mild cases a little stimulant and fresh air are the best remedies. Some of these disturbances of the functions are occasionally felt by the inveterate smoker, who also is liable to suffer from what is known as 'smoker's sore throat.' This makes itself evident by an irritable state of the mucous membrane at the back of the throat, with dryness, producing a tendency to cough and an enlarged, soft, sore condition of the tonsils, which renders it painful to swallow. It may exist without detection for a long time; but if a damp, cold, foggy state of the air arises, the throat becomes troublesome and painful, enlargement of the tonsils is detected, and the symptoms become much aggravated by any attempt to smoke. When smoking is altogether suspended it soon disappears, but it is incurable while the habit is persisted in, although the more troublesome symptoms may be temporarily alleviated.

The combustion of tobacco in smoking is never complete. While there are large quantities of carbonic acid and water—the ultimate products of complete combustion—produced, there are also many organic substances which are formed or become released by the heat, and which distil over with the gaseous bodies. It is the condensation of these volatile substances in very minute particles, in a similar manner to the condensation of steam at the kettle-spout, which gives rise to the appearance of smoke. The colour of the smoke is dependent on the quantity of these substances present, and the rapidity with which they are condensed. The burning of tobacco should be free, with a clean ash, but not too rapid. If it is retarded from any cause, such as the improper fermentation of the leaf, or the presence of wrong mineral constituents, then objectionable products are obtained which possess a disagreeable taste and odour. Moreover, carbonic oxide—a distinctly poisonous gas—is produced in considerable amount. All these substances tend to create the unpleasantness so often experienced with a badly burning cigar. A large proportion of the nicotine is consumed or destroyed in the burning, the ratio depending on the freeness or completeness of the combustion. The bulk of it, therefore, is not absorbed into the system, as some would make out. Indeed, it is impossible for it to be so, as one ordinary cigar contains enough nicotine to poison two men. A tenth of a grain will kill a medium-sized dog, so that a quarter of an ounce of mild tobacco would contain enough to poison twenty or thirty dogs. The other principal products of the burning are ammonia and its compounds, an empyreumatic oil, and a dark, bitter, resinous substance. The first named is very objectionable both to taste and smell if in undue proportion. The last two are very evident, the former in the odour of stale tobacco, and the other in the bitter taste of the oil in the stem of a foul pipe, and both largely impregnate the smoke. These organic substances begin to be deposited directly they are formed, so that some remains in the mouth, and if the smoke is swallowed or passed through the nostrils, much more will be retained and absorbed into the system—certainly an undesirable result.

It will be quite evident that the least harmful method of smoking is the use of a long pipe made of an absorbing material, such as clay or meerschaum. After this a short pipe, then the cigar and cigarette. In the progress of smoking a cigar the oils, &c., partly become condensed in it, and are at the same time drawn along until the end becomes nearly saturated with them. This end piece is often consumed with great eagerness and relish, but it is the most harmful part, and is liable to produce dyspepsia, especially with an empty stomach. The specifically deleterious effects sometimes due to cigarette-smoking may depend on poisonous substances used in preparing the cigarette-papers. The best time for smoking is unquestionably after a meal, and it should not be indulged in immediately before one. The habit of snuff-taking is perhaps the least harmful of the varied uses of tobacco, as the amount consumed must be within reasonable limit. Chewing, on the other hand, is doubtless the most deleterious. Owing to the rapid growth of cigarette-smoking, laws have been passed in the United Kingdom and most of the United States prohibiting smoking by youths.

Other Uses.—Although on its introduction into Europe the cultivation of the plant was advocated on account of its medicinal virtues, it is now very little used for them. It has been found effective in spasmodic cases, but at the present time there is only one preparation in the British Pharmacopœia—an infusion of the leaf in water—and this is rarely used. Nicotine is an antidote in poisoning by strychnine, and *vice versâ* strychnine will act as an antidote to nicotine. During convalescence after diseases such as meningitis (where the throat has been attacked by a germ), tobacco-smoking is sometimes recommended on account of its antiseptic qualities. An infusion of tobacco is an excellent insect-destroyer, and the spraying of the leaves of a plant with water containing it is very effectual. The juice or 'sauce' squeezed out of the leaves in their preparation for tobacco is occasionally sold and used as a sheep-wash.

British-grown Tobacco.—From the time of its introduction down to nearly the end of the 18th century, when it was altogether banished, the successful cultivation had always more or less been carried on. James I. and Charles I., of course, prohibited it, but without effect. Charles II., when he commenced to derive revenue from the imported leaves, imposed so heavy a tax on the home-grown article as it was hoped would stop its cultivation. The surreptitious growth was continued, in spite of all laws to the contrary, right down to the reign of George III., when it was stopped by an act passed in 1782. The plantations in Yorkshire were then destroyed, and the planters imprisoned and heavily fined. Since 1886 experiments have been made with success, though not without opposition, due to considerations of excise; and a little tobacco is grown in Hants and Surrey. More is done in Ireland, where tobacco-growing, prohibited in 1660, was revived in 1779, and stopped again in 1831, but is now permitted in various places by arrangement.

TOBACCO-PIPES.—The oldest tobacco-pipes known

are those which have been found in the ancient grave-mounds of the Mississippi Valley. These are in various kinds of stone, some being carved into the form of human heads and others into the shape of various animals, but the most common kind has a plain, more or less conical bowl. All have a short, broad, slightly curved, perforated stem, forming a sort of base for the bowl. Among the animals represented are the beaver, the bear, the seal, the frog, and various kinds of birds. But the most interesting of all are what are called 'elephant-pipes' (fig. 3, *f*), of which two have been found. These unmistakably represent an animal like the elephant, only the tusks are wanting. This is not the only apparent representation of the elephant in American antiquities. The matter has given rise to animated controversy among archæologists.

Of modern or comparatively modern American pipes, the most interesting are the Calumet (q.v.) or pipe of peace, the tomahawk-pipe (see TOMAHAWK) or war-pipe, and the elaborately and grotesquely carved stone-pipes made by the Indians of the North Pacific coast, which at first

Fig. 3.—Mound Pipes:
a, 'monitor' pipe; *b*, beaver pipe; *c*, pipe carved in the form of a human head; *d*, serpent pipe; *e*, bird pipe; *f*, elephant pipe. (From *American Naturalist*, April 1882.)

glance do not look like tobacco-pipes at all. The pipes of wood and whale's bone made by the Stickeen Indians, in the form of boats bearing houses, are also very curious.

Except what were made in earlier times in America, there are, of course, no tobacco-pipes of a date prior to the end of the 16th century. Nevertheless it is possible that some prehistoric and Roman objects may be pipes that have been used for smoking; for, besides tobacco, many other substances are or have been smoked—willow-bark, various roots, mushrooms, sawdust, coltsfoot, opium, hemp, leaves of rose, chestnut, beetroot, maize. Some of these are in common use in the East (see OPIUM, for instance), and have made their way to some extent in Europe and America. Others are known in the West among those to whom economic, legal, or parental obstacles have debarred the use of tobacco, or unmixed tobacco. The first common clay-pipes manufactured in Europe were perhaps those of England and Holland. Some of them, of small size, are known as Elfin Celtic, or fairy pipes. Pipes of baked clay show great diversity of shape and ornament. The finest kinds of these were made during the latter half of the 18th century at Sèvres, Chelsea, Dresden, Vienna, and other famous European porcelain-works, many clever artists having been employed in decorating them. Porcelain pipes, but mostly of a plain kind, are still largely made in Germany and in the Tirol. Modern French clay-pipes often display skilful modelling. Meerschaum-pipes, many of which are exquisitely carved, are made in large numbers in Austria, and artificial meerschaums in much greater quantities. The ordinary 'briar-root' pipes are cut out of the wood of the tree heath (*Erica arborea*; Fr. *bruyère*), which grows in southern France (including Corsica) and Italy, but cherry-wood is also used.

A great variety of other materials are or have

Fig. 4.—Indian Calumet.

been used for tobacco-pipes. Among these may be mentioned silver, brass, and other metals, glass, ivory, horn, cane, bamboo, corn-cobs, calabashes, and various kinds of stone. Equally numerous have been the ways of decorating their stems and bowls, such as by enamelling, chasing, engraving, carving, and inlaying. The same thing may be said of pipe-cases and tobacco-boxes. In some parts of the world tobacco-pouches are beautifully embroidered. The Hookah (q.v.) or narghileh bowls of India and Persia are often most elaborately ornamented. Pipes made by the Kookies (Manipur) have reservoirs for collecting the tobacco-juice, which is afterwards put into the mouth. The pipes used by the Kirghiz, or at least some of them, have three bowls. Some singular forms of tobacco-pipes are found in uncivilised countries. In New Guinea they consist of capacious hollow cylinders of bamboo, the large volume of smoke which these contain being drawn into the mouth by an aperture at the end. In the Zambezi district of East Africa the stems are formed of an antelope's entire horn, from the middle of which a vertical piece of wood rises, carrying the bowl. The western Eskimo uses pipes with remarkably small metal bowls, and such pipes, though different in form, occur also in China and Japan.

See Fairholt, *Tobacco, its History and Associations* (new ed. 1876); Wagner, *Tabakcultur* (new ed. 1888); Killebrew and Myrick, *Tobacco Leaf, its Culture, &c.* (1897); Tanner, *Tobacco: from Grower to Smoker* (1912); Dunhill, *The Pipe Book* (1925); Machen, *The Anatomy of Tobacco* (1926); and Bragge, *Bibliotheca Nicotiana* (1880).

Tobago, geographically the most southerly of the Windward Islands, lies about 20 miles NE. of Trinidad, is 26 miles long, from 6 to 7½ broad, and 114 sq. m. in area. The island was discovered by Columbus in 1498, and named by him Assumption; the name of Tobago is supposed to have arisen from the free use of tobacco by the Caribs when first visited by Europeans, or, according to others, from the shape of the island, resembling a Carib pipe (*tabaco*). Frequently contested between Dutch, English, and French, it came permanently into British possession in 1803. The island is volcanic, its surface being irregular and picturesque, and abounding in conical hills and spurs, all connected by a ridge running through the interior, the greatest elevation of which is 1800 feet above the level of the sea. From the high ridge descend deep and narrow ravines, which terminate in small alluvial plains. About a third of the island is densely forested. Scarborough (pop. 800) is its capital, pleasantly situated on the south side, and at the base of a conical hill (425 feet), crowned by Fort King

George, now without garrison. Its delightful climate makes Tobago a health and holiday resort. The chief exports are coconuts, copra, cocoa, sugar, rum, molasses, live-stock, and of late rubber, tobacco, and cotton. Pop. 25,000. The island was united with the colony of Trinidad in 1889, and in 1899 was made one of the wards of Trinidad.

Tobermory, a town in the north of the island of Mull, Argyllshire, 28 miles WNW. of Oban, was founded in 1788 at the head of its sheltered harbour. It has fish industries. A ship of the Spanish Armada sunk there has occasioned much treasure-hunting, not altogether without success. Pop. 850.

Tobin, JOHN (1770–1804), was an unlucky dramatist who spent weary years in trying to get his plays accepted, and seeing them successively rejected till the very year of his death, when his *Honey Moon*, his fourteenth piece, was not merely accepted at Drury Lane, but secured a success it maintained for twenty years. Tobin, born in Salisbury, was articled to a solicitor in Lincoln's Inn, and practised law there while writing his plays. His *Honey Moon*, a comedy mostly in verse, was translated into French by Charles Nodier; other comedies in prose or verse were *The Curfew*, *The Connoisseur*, and *The Faro Table*. A volume of his plays was published in 1820, with a Life by Miss Benger.

Tobit, THE BOOK OF, one of the most curious and interesting of the Old Testament apocrypha, tells of Tobit and Tobias, his son. Tobit was a pious, upright, and God-fearing Israelite of the tribe of Naphtali, who had been carried captive to Nineveh by 'Enemassar' (Shalmaneser). Among his many good works was the practice of defying the prohibition of the Assyrian kings by secretly burying the bodies of his slain fellow-countrymen. He was at last discovered, and deprived of all his goods in consequence. To add to his misfortune, through an accident that befell him as he slept in the open air one night, he became blind. In his poverty and distress he resolves to send his son Tobias to Rhagæ (Rai) in Media to recover an old debt from a friend. Tobias finds a companion for the long journey in an unknown youth (really the archangel Raphael) who on the journey gives him much valuable information and advice. Acting on this, he catches a great 'fish' in the Tigris, and secures its heart, liver, and gall. By means of the first two he is able to deliver from the power of the evil spirit Asmodeus his lovely cousin Sara, daughter of Raguel, at Ecbatana, whom he marries and, after recovering the debt for which he had been sent, leads back to his father's house. Arrived at home, he is able with the gall of the fish to cure his father's blindness. The book closes with Tobit's psalm of thanksgiving, and relates how he enjoyed a hundred years' happiness after these events, Tobias also living to see the age of 127. The Book of Tobit exists in Greek, Latin, Syriac, Aramaic, and Hebrew. There is a great deal to be said in favour of the view that the original language was Greek; but there are traces of several recensions of the book, and several different sources have been drawn upon by the author or later editors. In particular, i. 21 *seq.*, ii. 10, xi. 18, xiv. 10, 15, refer to the ancient and widespread Story of Ahikar (see the edition by Rendel Harris), an Aramaic version of which was current at least among the Jews of Elephantine in Upper Egypt in the 5th century B.C. But the present book can hardly have been written before the 3d century B.C., and it can perhaps be most appropriately assigned to the period of the Jewish struggles for independence, when, for example, it was the complaint of the faithful that their oppressor had cast out many unburied (2 Macc. v. 10). Again, if originally written in Greek, it probably had its origin in Egypt. In fact, it has never been widely known in the Syrian Church; its author's acquaintance with the eastern localities he names is superficial and not always accurate; and it has been pointed out that the 'fish' caught in the Tigris is most probably in reality the Egyptian crocodile, of which we know from ancient medical writers that the smoke of its liver used to be regarded as a cure for epilepsy, and its gall for leucoma. But those who trace the story to a Persian origin are also so far justified by certain facts. Asmodeus is manifestly the Persian evil spirit Aeshmâ Daevâ, and Raphael has the attributes of the protecting spirit Çraosha. The presence of the dog, too, who goes out and returns with Tobias and Raphael denotes rather a Persian than a pure Hebrew source, the Jews regarding that animal as unclean, while with the Iranians it is sacred, and the companion of Çraosha.

See D. C. Simpson in Charles's *Apocrypha and Pseudepigrapha* (1913), i. 174–241 (full discussion and bibliography), and art. APOCRYPHA.

Tobogganing. See SLEDGES.

Tobolsk, a town of western Siberia, in the Ural region, stands at the confluence of the Irtish and the Tobol, nearly 2000 miles east of Leningrad. Its situation north of the great main route between Russia and Siberia is unfavourable for the development of commerce. Pop. 15,000.

Tobo'so, EL, a small town (pop. 2000) in the Spanish district of La Mancha, 60 miles SE. of Toledo, the home of Don Quixote's peerless Dulcinea del Toboso.

Tobruk, a port with a small but deep and well-sheltered port on the north coast of Barca, 80 miles from the Egyptian frontier, occupied by the Italians in October 1911; pop. 4000.

Tocantins, an important river of Brazil, rises in the state of Goyaz, flows north through the state of Pará, and finally, after a course of 1500 miles, widens into the Pará (q.v.), 138 miles from the Atlantic. Its principal affluent is the Araguay (1600 miles), which joins it at the northern extremity of Goyaz, and bears along a greater volume of water than the stream to which it is tributary. The Tocantins is traversed by steamers to 400 miles from the sea; and above the line of falls and rapids 400 miles more is navigable.

Toccata, primarily, a composition designed to exhibit the performer's touch on a keyboard instrument, or one in which he seems to try the touch of the instrument in a series of runs and chords before breaking into a fugue. The term came to be used somewhat loosely, sometimes for a sort of overture. See the section on *Fantasia* in the article MUSIC.

Tocharish. See TOKHARISH.

Tocqueville, ALEXIS CHARLES HENRI CLÉREL DE, was born at Verneuil, in the department of Seine-et-Oise, 29th July 1805. His father, the head of the ancient family of Tocqueville in Normandy, whose wife was a granddaughter of Malesherbes, narrowly escaped the guillotine, but did not emigrate, and, having preserved his property, reassumed in 1815 the title of Count. Young Tocqueville was called to the bar at Paris in 1825, and after a short tour in Italy became an assistant magistrate at Versailles. Sent in 1831 to America to report on the penitentiary system, he wrote *De la Démocratie en Amérique* (1835), which was the first carefully-thought-out book written in Europe on the subject, and made at once a great sensation. The accuracy of the statements, the skill with which the matter had been digested, and the beauty of the style were loudly praised by critics.

The author was described as the continuator of Montesquieu, and the greatest political writer of his time. He became a member of the Academy of Moral Sciences, and in 1841 of the French Academy. The work is a fair and lucid statement from a moderate point of view; but his knowledge was hardly sufficient to bear the whole deductive structure of system which he built on it. In 1835 he was enthusiastically welcomed by the English Whigs, and he married Miss Mottley, an Englishwoman. He shortly afterwards, by a family arrangement, entered into possession of Tocqueville. In 1839 he was elected to the Chamber of Deputies by an overwhelming majority. As a speaker he did not succeed, but he exercised great influence. Immediately after the revolution of 1848 he was the most formidable opponent of the Socialists and extreme Republicans, and as strenuously opposed Louis Napoleon. He became, however, in 1849 vice-president of the Assembly, and from June to October was minister of Foreign Affairs. After the *coup d'état* he returned to Tocqueville, where he devoted himself to agricultural pursuits. He there wrote *L'ancien Régime et la Révolution* (1856), a work now regarded as wanting in width and depth of knowledge, and too favourable to the Revolution. He had also written a work on the reign of Louis XV. (1846–50). He died at Cannes, 16th April 1859. Tocqueville's *Œuvres et Correspondance Inédites* were published in 2 vols. (1860; trans. 1861), by his friend G. de Beaumont, with a biographical notice. His *Œuvres Complètes* appeared in 9 vols. in 1860–65. See his *Souvenirs* (trans. 1896); a monograph by Jaques (Vienna, 1876); his *Correspondence with Nassau Senior* (2 vols. 1872); and an *Essai politique* on him by R. P. Marcel (1910).

Tod, James (1782–1835), author of *Annals and Antiquities of Rajasthan* (1829–32; new ed. 1920), was born at Islington, obtained an East Indian cadetship, and as an officer of the Bengal infantry collected much topographical information. He organised the intelligence department in operations against the Pindharis (1817), and in 1818–22 was political agent in the western Rajput states. He returned to England in 1823, became librarian to the Royal Asiatic Society, and a lieutenant-colonel. Besides his classical *Annals and Antiquities*, he wrote *Travels in Western India*, published with a memoir in 1839.

Todas. See Neilgherry.

Todd, David Peck, American astronomer, born at Lake Ridge, New York, 19th March 1855, studied at Amherst College, Mass., where he became professor of Astronomy in 1881. He worked on the *United States Nautical Almanac*, led many eclipse and other expeditions, designed several observatories, and wrote *A New Astronomy* (1897) and *Stars and Telescopes* (1899, founded on Lynn's *Celestial Motions*).—His wife, Mabel Loomis, wrote books of astronomy and travels, and edited the poems and letters of her friend Emily Dickinson.

Toddy, the name given in the East Indies to the fermented juice of various palms (Caryota, Cocos, Phœnix, Borassus, &c.; see Palm) from which Arrack (q.v.) is distilled. It is applied in Britain to a mixture of whisky, sugar, and hot water, which forms a popular drink in Scotland.

Todea, a genus of leptosporangiate ferns, of the family Osmundaceæ, inhabitants of the southern hemisphere. The *sori* are not, as in Osmunda, borne upon special pinnæ, but upon the backs of the ordinary pinnæ. *Todea africana* is among those ferns that exhibit apogamy, or the dropping out of the sexual process from the life-cycle, the prothallus producing a new fern-plant by budding. Ferns of this genus, called crape-ferns, are cultivated in greenhouses.

Todhunter, Isaac (1820–84), mathematician, was born at Rye, studied at University College, London, served some time as a tutor, and so was enabled to enter St John's College, Cambridge, where in 1848 he graduated senior wrangler and Smith's prizeman. Elected to a fellowship in his college, he became eventually its principal mathematical lecturer, and ere long his handbooks of Algebra, Geometry, Conic Sections, Trigonometry, Mensuration, and Mechanics made his name known, if not always honoured, in every schoolroom in England. For more advanced students his indefatigable energy and rare faculty of exposition provided also manuals on the Differential and the Integral Calculus, Analytical Statics, Plane Co-ordinate Geometry, and Analytical Geometry.

Todi, a city of Umbria, Italy, 25 miles S. of Perugia by rail. It is situated on a hill high above the confluence of the Naja with the Tiber. It was the ancient Tuder, and has three successive lines of wall, Etruscan, Roman, and mediæval. There are also various Roman ruins; the pavement of the piazza rests upon the vaults of a large cistern, while it is surrounded by massive mediæval palaces; and there is a fine substruction wall with niches, perhaps belonging to the forum. The mediæval aspect of the town is striking, and the cathedral has a fine 14th-century façade. Still finer is the Renaissance church of Sta Maria della Consolazione, perhaps after the designs of Bramante (though not executed by him), begun in 1508 and finished in 1607. Fra Jacopone da Todi, reputed author of the *Stabat Mater*, was born here. Pop. of commune (1921) 18,245.

Todi, Jacopone da, poet and mystic, believed to have been born about 1228 at Todi, in the duchy of Spoleto, from an advocate to have turned Franciscan about 1268, to have been imprisoned for satirising Boniface VIII., and to have died in 1296 or 1306. Next to nothing, however, is known with certainty about his life, and many of the poems once thought his are now attributed to others. See the 'spiritual biography' of him by Evelyn Underhill (1919).

Todleben, Eduard Ivanovitch, Russian general, was born of German descent at Mitau in Courland, 20th May 1818. After studying at Riga and St Petersburg he distinguished himself as a lieutenant of engineers in the Caucasus, and was with the engineer corps when the Russian army entered the Danubian Principalities in 1853. His genius as a military engineer was discovered before the Russian army crossed the Pruth, on its retreat from the Principalities; and when the French and English undertook the siege of Sebastopol, Colonel Todleben was sent to assist in its defence. He arrived in the middle of April, and the fortifications were soon placed under his direction. The prodigious activity displayed by the Russians in making good the damage sustained by the heavy fire of the enemy filled the allies with astonishment. Everywhere massive ramparts of earthworks, mounted with formidable batteries, rose up as if by magic at each threatened point within the line of defence. During the latter part of the siege he was wounded in the leg. For services in the siege he was created a general, decorated, and made director of the engineer department in the war office. In 1865 he visited England, and was cordially received. He held no very important post till disasters began to befall the Russian army during the Turkish war. Todleben was remembered, and was called to undertake the siege of Plevna (q.v.), which, after a brilliant defence, he took. He was subsequently made commander-in-chief in Bulgaria, and at the time of his death, 1st July 1884, was governor of

Odessa. He wrote an admirable account of the defence of Sebastopol (French ed. 1864). There are Lives by Brialmont (Brussels, 1884) and Krähmer (Berlin, 1888). See Kinglake's and Hamley's histories of the Crimean War.

Todmorden, a municipal borough of the West Riding of Yorkshire, on the border of Lancashire, prettily situated among hills on the Calder, 9 miles N. by E. of Rochdale, 18½ NNE. of Manchester, and 13 W. of Halifax. The classical town-hall, the gift of the Fielden family, was erected in 1875, and in Fielden Square is a bronze statue by Foley of John Fielden, M.P. (1784–1849), the founder here of a large firm of cotton manufacturers; he was largely responsible for the passing of the 'Ten Hours' Act, 1847. The old county boundary of Lancashire and Yorkshire passes through the town. The public library, which belongs to the corporation, contains a remarkable collection of books on tobacco. Textile goods, especially drills, are the chief production of the town. Pop. (1921) 23,888.

Toes. See FOOT.

Tofana. See POISON.

Tofieldia, a north-temperate genus of Liliaceæ, with a three-lobed calyx-like involucre (calyculus), and sword-shaped equitant leaves. The Scottish asphodel (*T. palustris*), found in wet places on mountains in Britain, resembles a very small plant of Narthecium, with greenish flowers.

Toga (Lat., from the root of *tego*, 'I cover'), the principal outer garment of the Romans, was a thick woollen cloth, originally worn over a loin-cloth or apron. When the tunic was adopted the toga became more bulky and was worn in a looser manner. It was probably of Etruscan origin, and yet it came to be considered the distinctive badge of the Roman citizen, whence the Roman people are called *togati* or *gens togata*. Cisalpine Gaul, which had adopted the Roman garb, was distinguished as *Gallia togata* from *Gallia braccata* or Gallia Narbonensis, which retained the Gallic trousers. Scholars are divided as to its shape, some making it elliptical with pointed ends, while others declare that the most usual form was a crescent, the back of which was an elliptical curve with a circular segment of cloth sewn on to its concave side. The toga of ordinary life was white in colour. The *toga prætexta* had a broad purple border, and was worn by children and by the curule magistrates and censors. When the young Roman was declared to be legally of age he assumed the ordinary toga, on this account called the *toga virilis*. Persons in mourning (*sordidati*) and persons under impeachment wore the *toga pulla*, a garment of a dark colour; while those who were seeking office were wont to dress themselves out in garments which had been made artificially bright by the help of chalk—hence their name of *candidati*.

Togo, COUNT HEIHACHIRO, Japanese admiral, born at Kagoshima in 1847, studied at Greenwich, served against China (1894), and as commander-in-chief of the Japanese navy completely defeated Russia in the war of 1904–5.

Togo, or TOGOLAND, in 1884–1919 a German protectorate on the Slave Coast, east of the British Gold Coast, west of Dahomey, between 0° 30′ W. and 1° 41′ E. long., the boundary towards the interior being an artificial line. The area is estimated at 33,000 sq. m., and the pop. at 1,000,000. Togoland had been prosperous since it was annexed by Germany, no contribution from the imperial government being required, and its trade had grown satisfactorily. It was overrun by British and French in the beginning of the Great War. About one-third (in the west) was assigned to Britain, the remainder, with the whole coast, to France, as mandatory powers. Togo, the largest native town (pop. 5000), is on Lake Togo; Lome is the administrative capital and port.

Tohoku University has its seat at Sendai (q.v.).

Toise, an old French linear measure containing 6 French feet (6·4 English feet).

Toisech, an ancient Gaelic chief of lower rank than a *mormaer*.

Toison d'or. See GOLDEN FLEECE.

Tokat, a town of north-eastern Anatolia, 70 miles inland from the Black Sea; pop. 30,000.

Tokay, a small Hungarian town on the Theiss, 130 miles NE. of Budapest, is known for its famous wine, grown on the Hegyalja Mountains. Great care is bestowed on the proper assortment of the grapes (which are never gathered till fully ripe), and also on the preparation of the wine—of which some thirty-four sorts are reckoned; but all of these may be grouped into the two classes of sweet and dry. The wine is brownish yellow while new, changing to a greenish hue as it grows older. The average annual produce of the Tokay vineyards is over 2,000,000 gallons. Tokay wine enjoys an immense reputation. The *Ausbruch* is one of the finest kinds, but is surpassed by the *Essence*, regarded by many as the noblest of all wines, made from the juice that exudes from the grapes by the pressure of their own weight. Genuine Tokay is obtainable by wine-merchants only in small quantity (this is especially the case with the more valuable sort, the sweet or imperial Tokay), and is largely mixed with inferior wines to increase the amount. Large quantities of 'imitation' Tokay are made by French and German chemists, and sent to all parts of Europe, not excepting Hungary itself.

Tokelau, or UNION ISLANDS, a British group of small South Pacific islands, north of Samoa, detached in 1926 from the Gilbert and Ellice Islands Colony and placed under New Zealand's jurisdiction; area, 7 sq. m.; pop. 1000.

Token. For token money, see MONEY. In Scotland it was usual both in the Established Church and in seceding churches for the minister and elders to furnish communicants with tokens or small vouchers of brass or pewter, serving as passes permitting them to take their places at the communion table, whereupon the tokens were returned to the officiating elders. This system of metal tokens has now been generally superseded by cards.

Tokharish, a name given, perhaps somewhat incautiously, to an extinct Indo-European language in which, in the 20th century, an early Buddhist literature has been discovered in Eastern Turkestan and Kansu. This literature (perhaps of the 8th or 9th century A.D.) consists of translations of Indian religious and medical books. Examples of monastic book-keeping also occur. In treatment of palatal sounds the language falls with the 'centum' group (Greek, Italic, Germanic, Keltic), and it resembles Italic and Keltic in forming the passive with *r*. The Tokhari of history conquered Bactria and came into collision with the Parthians in the 2d century B.C.

Tököly. See TEKELI.

Toktamish, chief of the eastern Kirghiz and of the Golden Horde. See MONGOLS.

Tokugawa, a family that ruled Japan as Shôguns from 1600 to 1868. See JAPAN.

Tokushima, chief town of Shikoku, Japan, at the NE. end of the island; pop. 75,000.

Tōkyō, or TŌKEI ('Eastern Capital'), the chief city of the Japanese empire, is situated on the Bay of Tōkyō on the east side of Hondo (the main

island). Until 1868, when the emperor removed his court thither from Kyōtō, it was known as Yedo ('Estuary Gate'). Originally the site of a small castle, it was chosen by Tokugawa Iyeyasu in 1590 as the seat of his power, and 80,000 of his warriors settled there. The *daimyos* (territorial lords) were also compelled to spend six months of the year in Yedo. By reason of its position at the mouth of the rivers which drain Musashi, the largest of the plains of Japan, it is well fitted to be a national centre. From it Japan was reduced to unity under the Tokugawa *Shôguns*, and the emperors, in resuming direct power on the fall of the Shôgunate in 1868, sought to carry on the traditions of centralisation by establishing the restoration government in Yedo. The city gradually enlarged seaward, as it took possession of the growing delta of the river Sumida, on whose banks it is situated. The immense enclosures (*yashiki*) formerly inhabited by the nobles and their retainers gradually disappeared, and handsome modern buildings in brick for the use of the various government departments took their place. The palace (1889) is a fine structure in Japanese style, with a picturesque double ring of high walls and broad moats. Tōkyō is subject to earthquakes, but nothing has equalled the appalling catastrophe of 1st September 1923, when an earthquake was followed by a fire lasting two days. Want of food and water caused further suffering among the inhabitants, about 60,000 of whom were killed, while about two-thirds of the town (including almost all the government offices, the banks, business offices, railway stations, &c.) was destroyed. The breaking of gas-pipes was largely responsible for the fire, which swept away the small wooden houses. Reconstruction, shared by the government and the municipality, began immediately. Several large parks with tree protection (to act as refuges in time of crisis) were planned, canals and bridges laid out, and streets widened. Owners of land had to give up one-tenth of their holdings without compensation. The central city area has roads extending to the suburbs like spokes of a wheel, and other roads encircle it in a series of concentric circles. Buildings in the business part must be fireproof and made of ferro-concrete, and drains, &c., must be earthquake-proof as far as possible. Electric tramways run throughout (also to Yokohama), while the town is well provided with hospitals, theatres, &c., and is an important railway centre. The imperial university (the splendid library of which perished in 1923) has over 5000 students, and there is a large number of colleges and higher educational institutions, as well as an observatory, zoological garden, art gallery, and learned societies, &c. The harbour is inadequate (Yokohama serving as the real port), but great extensions have been variously projected. The climate of Tōkyō is moist and unhealthy in summer, but is generally fine and healthy from September to the beginning of June. The winter nights are cold, and the keen winds of spring sweep the dust violently through the streets. There used to be a foreign concession at Tsukiji, on the south bank of the Sumida; but since the abolition of extra-territoriality, foreigners have been free to live anywhere in the city. Tōkyō resembles Paris in the overshadowing importance of its place in the national life; it is alive with new schemes and undertakings, and almost every phase of modern industrial civilisation is to be found within its area of 30 sq. m. Pop. (1872) 779,361; (1891) 1,155,290; (1908) 2,186,079; (1925) 1,995,567. See JAPAN, YOKOHAMA.

Toland, JOHN, deistical writer, was born of Catholic parents near the village of Redcastle, County Londonderry, 30th November 1670. He entered the university of Glasgow in 1687, but removed to Edinburgh, where he abandoned the Roman Catholic faith and took his M.A. in 1690. At Leyden, where he spent two years, he studied theology under Spanheim. He resided for some time at Oxford, and in the Bodleian collected the materials of more than one of his later publications. In *Christianity not Mysterious* (1696) he expressly claimed to accept all the essentials of Christianity, but maintained that the value of religion could not lie in any unintelligible element, and that no part of the truth could be contrary to reason. He chose his title with evident reference to Locke's *Reasonableness of Christianity* (1695), and professed to have at heart the defence of revelation against deists and atheists. But the tendency of the work was obvious; it created a great sensation in the theological world, and led to several replies (by Payne and Stillingfleet amongst others). Prosecuted in Middlesex, Toland returned to Ireland, where his book was burned publicly by the common hangman, and Toland fled to London. In *Amyntor* (1699) and other works he fairly raised the question as to the comparative evidence for the canonical and apocryphal scriptures, with professed candour but unmistakably mischievous intent. A pamphlet entitled *Anglia Libera*, on the succession of the House of Brunswick, led to his being received with favour by the Princess Sophia when he accompanied the ambassador at the court of Hanover; and from 1707 to 1710 he lived in various Continental towns. His after-life was that of a literary adventurer, and forms one of the most painful chapters in D'Israeli's *Calamities of Authors*. In *Nazarenus* (1720) he insisted, somewhat on the lines developed by Semler and the Tübingen school, that there were two distinctly opposed parties in the early Christian church—one Judaistic (which he identified with the Ebionites) and one Pauline or liberal. His *Pantheisticon* was an offensive parody of the Anglican liturgy. He resided from the year 1718 at Putney, where he died, March 11, 1722.

Besides the works named, and various defences, apologies, and pamphlets, he wrote a life of Milton (1698); an *Account of Prussia and Hanover* (1705); *Adeisidæmon* (1709); *Origines Judaicæ* (1709). See the books cited under the heading DEISM in this work; and for Toland's partial anticipation of Semler and Baur, see an article in the *Theological Review*, 1877. There is a life by Des Maizeaux prefixed to two vols. of Toland's posthumous works (1747, including a *History of the Druids*), and a monograph by Berthold, *John Toland und der Monismus der Gegenwart* (Heidelb. 1876).

Toledo, a famous city of Spain, capital of a province, and long the capital of the whole country, stands on the north bank of the Tagus, by which it is encompassed on three sides, 40 miles SSW. of Madrid by rail. It is situated on a number of hills, 2400 feet above sea-level; and the climate, excessively hot in summer, is bitterly cold in winter. The Tagus, surrounding the city on the east, south, and west, and flowing between high and rocky banks, leaves only one approach on the land side, which is defended by an inner and an outer wall, the former built by the Gothic king Wamba in the 7th century, the latter by Alfonso VI. in 1109, and both remarkable for the number and beauty of their towers and gates. Seen from a distance the city has a most imposing appearance; within it is gloomy, silent, inert, and its narrow streets are irregular, ill-paved, and steep. In the middle of the city rises the lofty, massive cathedral, surrounded by numerous churches and convents, mostly deserted. The cathedral, built in 1227–1493, on the site of a former mosque (consecrated to Christian uses in 1086, but pulled down to make way for the new church), is a large oblong edifice with semicircular apse, and belongs to the

simplest, noblest style of Spanish-Gothic, with a few touches of the florid Gothic, classical, and Saracenic styles. The interior is more impressive than the exterior, which is blocked by other buildings on all sides save one. It was ransacked and plundered in 1621 and 1808, but it still contains some admirable stained glass, and the choir is a perfect museum of sculpture. The cathedral is 404 feet long and 204 feet wide, and has five naves; the tower is 329 feet high. Connected with the cathedral are an extraordinary number of chapels, of great interest, alike from their architectural beauty, their decorations, and their historical associations. The great square or Zocodover, thoroughly Moorish in its architectural character, is a fashionable promenade, and was long the site on which heretics were burned and bull-fights took place. Moorish architecture is conspicuous in some churches, and in two gateways. The Alcázar or old palace, the fortress commanded by the Cid, rebuilt as a palace in the time of Charles V. and subsequently, occupied the highest part of the city, but was burned down in 1887. The buildings of the town include a theological seminary, one or two old palaces, hospitals, what was once a great monastery, town-hall, &c. There are manufactures of church ornaments and vestments in gold, silver, and silk, and confections. The best Spanish is said to be spoken here. Toledan sword-blades, famous since old Roman times, are still made, but outside the city. The painter El Greco settled in Toledo, and many splendid examples of his work are to be found here. Pop. (1920) 25,251.

Toledo, the *Toletum* of the Romans, is of very early origin. It was the capital of the Goths during their dominion; in 714 it fell into the possession of the Moors, who retained it till 1085, when it was permanently annexed to the crown of Castile as capital. In the days of its highest prosperity it is said to have contained 200,000 inhabitants. It was the headquarters of the Inquisition. The university, founded in 1498, is long since extinct. The whole place has now a dilapidated and broken-down appearance. For the area and pop. of the province, see SPAIN.

Toledo, capital of Lucas county, Ohio, on the Maumee River, 8 miles from the western extremity of Lake Erie (to which a channel 17 feet deep has been dredged), and 92 by rail W. of Cleveland. It has a fine harbour, is on the Miami and Erie Canal, and is connected with all parts of the country by thirteen railways. Besides an immense union depôt, it has grain elevators holding 5,000,000 bushels, and a great trade is done in flour and grain, as well as lumber, live-stock, hides, wool, iron, cotton, and tobacco. There are great automobile works, manufactories of glass, coffee, &c., and all branches of iron industry, including bridge-works. Toledo was settled in 1832, and incorporated in 1836. Pop. (1880) 50,137; (1890) 81,434; (1910) 168,497; (1920) 243,164.

Toledoth Jeshu (Heb., 'the generations of Jesus'), an apocryphal work in Hebrew purporting to be a history of Jesus; really a mediæval series of clumsy, fragmentary, ribald fictions and burlesques. There are two recensions, of one of which Wagenseil published a Latin translation in 1681. This one may probably contain an ancient element; the other, which Huldrich translated into Latin in 1705, is not older than the 14th or 15th century.

See Baring-Gould, *The Lost and Hostile Gospels* (1874); *Notes and Queries*, 6th series, vol. xi. (1885) p. 212.

Tolentino (the ancient *Tolentinum*), an episcopal city of Central Italy, on the left bank of the Chienti, 10 miles SW. of Macerata. It was a fortified town of great natural strength; it has an interesting cathedral, dedicated to St Nicolas, the patron saint of the town (d. 1305), containing various works of art, and there are a number of mediæval houses. By the treaty of Tolentino (1797) Pope Pius VI. ceded Avignon to France, as well as the papal dominions in the Romagna (this cession was of course only temporary), and the finest treasures of the public museums and galleries of Rome, the great majority of which (though not all) were returned in 1815. Pop. of commune (1921) 13,065.

Toleration is the liberty conceded, especially where a particular form of religion is established by law, to those of other religious beliefs to publicly teach and defend their theological and ecclesiastical opinions, and to worship whom and how they please, or not at all. But no permission is thereby given to violate the rights of others, or to infringe laws designed for the protection of decency, morality, and good order, or for the security of the governing power. In Britain there are still in force certain statutes imposing penalties on opinions and practices, once regarded as criminal because of their offensiveness to God, such as Blasphemy (q.v.); but these laws are seldom executed now, the opinion having become prevalent that, except when the religious feelings of the public are so wantonly outraged as to make the perpetrator a nuisance, theological error is best opposed by refuting it, and that when those accused of Heresy (q.v.) are men of piety and earnest conviction any degree of severity short of extirpation tends rather to diffuse than to suppress their tenets. The right of private judgment in matters of faith and worship is now more generally recognised in practice than it used to be, though even yet many resent the exercise by their neighbours who differ from them of the freedom which they claim for themselves. In a church claiming infallibility, and believing that salvation is unattainable beyond her pale, it is not only consistent, but to her more earnest members must seem a duty, to prevent by force the spread of what is accounted a fatal heresy; and, in fact, toleration has never been either professed or practised by the Church of Rome. The Reformers, as a whole, while claiming freedom for themselves, by no means accepted the principle of tolerating what they regarded as pernicious doctrines: a notable case to the contrary is Calvin's treatment of Servetus (q.v.). The peace of Westphalia (1648), which closed the fearful Thirty Years' War, secured a religious and civil freedom in Germany for Catholics, Lutherans, and Calvinists, but for no others. Even the English Puritans, though long oppressed themselves, were so blind to the right of others to differ from them that in their own brief day of power they eagerly repudiated, by word and deed, as a monstrous and impious error, the principle of a universal toleration. In the Westminster Assembly of Divines (1643–46) the Presbyterian members fought successfully against the proposal of the Independents that all sects should alike be tolerated. 'We hope,' wrote Baillie to his Presbyterian friends in Scotland, 'that God will assist us to demonstrate the wickedness of such a toleration.' George Gillespie's view was similar. We accordingly find in the 23d chapter of the *Westminster Confession* an assertion of the duty of the magistrate to promote the true religion, and to restrain and punish heterodoxy—a principle which, soon after the Restoration, was found to work very inconveniently for the Presbyterians themselves, the magistrate being then one who differed from them as to what the true religion was. The Independents, on the other hand, had learned the lesson of toleration in Holland—that nursery of liberty in modern Europe—whither they had fled from oppression in the reign of James I. It is, however, a mistake to suppose that they were the first to

understand and practise the principles of religious freedom, for in the 16th century Zwingli and some of the Hungarian reformers disclaimed, by word and action alike, the notion that any man is entitled to assume, in his dealings with others, that his own interpretations of Scripture are true, and those of other men, if different, false and culpable.

The English sectaries who founded the American colonies, fleeing from religious intolerance, brought with them no larger toleration for others. In most New England states dissent was punished as heresy, though Roger Williams insisted that 'to punish a man for any matter of his conscience is persecution.' In Pennsylvania no man could hold office who did not acknowledge the deity of Christ; and in Maryland Quakers were fined and variously punished from 1659 onwards. To the keen discussions in Holland and England during the century which followed the Restoration; to the moderation or indifference which characterised the Protestant churches a hundred years ago; to the ever-increasing number and power of dissenters; to the enormous impulse given to the notion of personal rights by the French Revolution; and to that wider mental culture which enables men to see that diversity of mental gifts and acquirements naturally leads to diversity of opinion, it is that we must ascribe the tolerant spirit now generally diffused, especially in England and the United States. Not only is the *right* of free thought and discussion now generally recognised, but its *necessity* to the well-being of mankind is asserted by eminent thinkers. And in most civilised countries, though churches may be limited in their privileges, private freedom is accorded to all religious belief: Russia is of great Christian nations the most private freedom is accorded to all religious belief.

See Jeremy Taylor's *Liberty of Prophesying;* Milton's *Areopagitica,* his *Treatise of Civil Power in Ecclesiastical Causes,* and his treatise *Of True Religion, Heresy, Schism, Toleration, &c.;* John Owen's *Indulgence and Toleration Considered;* Barclay's *Apology for the Quakers;* Locke's *Letters concerning Toleration;* Paley's *Moral Philosophy;* Sydney Smith's *Letter to the Electors on the Catholic Question;* Martineau's *Rationale of Religious Enquiry;* Guizot's *History of Civilisation in Europe;* Buckle's *History of Civilisation;* Mill *On Liberty;* Lecky, *Rise of Rationalism* and *History of European Morals;* Bancroft, *History of the United States;* Bouché-Leclercq, *L'Intolérance Religieuse et Politique* (1912); Ruffini, *Religious Liberty* (trans. 1913); the church histories; and in this work the articles CATHOLIC EMANCIPATION, JEWS, PERSECUTION, works cited at FRIENDS, &c.; also SYDNEY (ALGERNON).

The ACT OF TOLERATION was an act passed after the English Revolution of 1689, with the hearty support of William III. It repealed the persecuting acts of Charles II.'s reign against conventicles, &c., and practically gave religious toleration to Protestant dissenters and Quakers, but expressly excluded Roman Catholics or anti-Trinitarians.

Toll, an old English word used for tax or tribute ('to whom tol tol;' Wyclif's Bible, Rom. xiii. 7), especially for long (like the German *Zoll*) applied to customs duties, but ultimately almost wholly restricted to money paid for the maintenance of roads by persons using them, and collected from travellers by collectors at toll-gates or toll-bars. Road-tolls were granted by Edward III., and the turnpike soon spread itself over all England, superseding 'statute-labour' in Scotland in 1750. The Rebecca Riots (q.v.) of 1843 were but one instance of the unpopularity of the impost; but in 1871 there were in most parts of the country toll-houses every six or eight miles, and about 5000 persons employed as toll-collectors (not including their families). A board affixed to the toll-house indicated the varying rates of dues enacted for an ass, a score of sheep, a riding horse, a cart, a one-horse gig, a carriage drawn by two horses, &c. Ireland first threw off this form of the burden, an act of 1857 abolishing the last in the island. In England twenty-seven toll-bars near London were abolished, and eighty-one on the north side of London in 1864, sixty-one on the south side in 1865. Others followed (in Scotland, in 1883, under the Roads and Bridges Act, 1878), but it was not till 1889 that the system in Great Britain was finally superseded (except on private roads) by that now in force, for which see ROADS. Bridge-tolls were all abolished in London in 1878–79, but they still survive in some places, and pier-tolls are common.

Tollens, HENDRIK (1780–1856), a Dutch poet, author of the national hymn.

Toller, ERNST, German dramatist and poet, was born of Jewish parents at Samotschin in 1893, and has associated himself prominently with Socialism. In 1919 he was imprisoned for his share in the Soviet outbreaks in Munich. His works include the plays *Die Wandlung, Masse Mensch, Die Maschinenstürmer;* and volumes of poems, *Gedichte der Gefangenen* and *Das Schwalbenbuch;* pitched in a distinctly high key, they reflect strongly his political ideas.

Tolosa, a town in the northern Spanish province of Guipúzcoa, 15 miles S. of San Sebastián by rail, makes cloth caps; pop. 11,000.—*Tolosa* is also the ancient name of Toulouse.

Tolstoi, or TOLSTOY, a noble Russian family, several of whose members have become eminent in diplomacy, war, and literature. Count Peter (1645–1729) was long a trusted agent of Peter the Great; Count Peter Alexandrovitch (1761–1844), one of Suvorof's generals, was under Nicholas I. head of a government department; Count Alexei Constantinovitch (1818–75) was one of the foremost of modern Russian dramatists, a lyrical poet and novelist (his historical novel, *Prince Serebrenni,* was translated into English in 1874); Count Dmitry Andreievitch (1823–89), reactionary minister of Education, was a champion of Russian orthodoxy and the Russifier of the Poles, whose *Romanism in Russia* was translated in 1874. But far better known outside of Russia is

COUNT LEO NIKOLAIEVITCH, poet, novelist, social reformer, and religious mystic, born 28th August (o.s.) 1828, at Yásnaya Poliána in the government of Tula. He was educated privately at Moscow, and on the family estate till 1843–46, when he studied at Kazan University; in 1851 he joined the army of the Caucasus on the Terek, was attached to the staff of Prince Gortschakoff in Turkey in the first stage of the Crimean war, and was at the storming of Sebastopol by the allies in 1855. He now retired from the army, and, already famous as a poet and novelist, spent a short time in the most brilliant literary and social circles of St Petersburg. He then travelled in Germany and Italy; in 1862 he married, and settled on his estates, devoting himself largely to educational work amongst the peasantry.

It was during his residence in the Caucasus that he wrote *Childhood, Boyhood, and Youth, Memoirs of Prince Nekludoff,* and *The Cossacks.* After the Crimean war he wrote three sketches of Sebastopol; during his foreign sojourn, *The Snow Storm,* and the *Two Hussars;* next came *Family Happiness, The Three Deaths,* and *Polikushka.* The first of his two great works, *War and Peace* (1865–68), gives a marvellously vivid picture of the Napoleonic campaigns against Russia and the national defence; like many Russian novels, it is devoid of a regular novelistic plot, and is a kind of chronicle of two families and their friends, showing how their fates

and characters were moulded by the events of that terrible time. The other great work, *Anna Karenina* (1875–78), is a melancholy tale of an ill-fated marriage, in which the inability to recognise the prosaic responsibilities of life leads to the suicide of the unhappy wife. It is, as Arnold said, less a work of art than a piece of life; but what it loses in art it gains in reality. 'There is an abundant and admirable exhibition of knowledge of human nature, penetrating insight, fearless sincerity, wit, sarcasm, eloquence, style.'

Soon after this he intimated to the consternation of his friends that he had finally resolved to renounce the career of poet and artist to devote himself to studying the pressing problems of life, remedying its grievances, and becoming the 'friend of the unfriended poor.' From that time he did not cease to write, nor even to write novels, but all his work was written with directly didactic aim. *Ivan Ilyitch*, *What People Live by*, *Where Love is there God is also*, *Two Pilgrims*, *The Dominion of Darkness*, *The Christianity of Christ*, *What I Believe*, and *Life*—all insist on a mode of thought and ideal of life in which revolutionary discontent and religious confidence, Puritanism and Quietism, hyper-Christian self-devotion and an almost Buddhist resignation, deep insight and morbid asceticism are strangely combined and commended by the author's literary power, transparent sincerity, and self-denying tenderness for all the weary, heavy-laden, and oppressed. True religion (not dogmatic orthodoxy) is for him the most valuable element in life, and, though rare in the cultivated, is common if not ineradicable in the working poor, in the people. His conception of Christ's Christianity is summed up in six canons: Do not war; do not judge; do not commit fornication; do not swear; do not give way to anger; do not oppose with force the evil-doer—this last carried to the point of not interfering by force to prevent a murder. The *Kreutzer Sonata* (1890) finds the trail of the serpent—carnal passion and baseness—not merely in most existing social conditions, but in art as now practised, and even in what for others are the sanctities of family life. Turgenief and Tolstoi, with many points of sympathy, never could agree, and had more than once a bitter quarrel; but on his deathbed Turgenief sent a loving message to 'Leo Nikolaievitch' beseeching him to return to literature. Tolstoi would have wholly dispossessed himself of his property to live as a peasant; but his wife refused to see her children exposed to hardship, and Tolstoi made over his estates to her and them. He lived as poorly as a peasant, laboured at mowing or sawing wood for any neighbour who asked him, and in his wife's house lived as a guest. In *What is Art?* (1898) he taught that only that art is good which moves the masses, and to good ends; what is written for the select can only be bad art. In *The Kingdom of God is Within You* (1893), *Master and Man* (1894), *Patriotism and Christianity* (1896), and *Resurrection* (1900) his departure from orthodoxy became increasingly manifest, the Holy Synod excommunicated him, and he persistently refused to return to the fold—he denounced the worship of Jesus as blasphemy and the sacraments as gross sorcery. In 1910 he suddenly left home, designing to end his days in ascetic seclusion, and, exposed to inclement weather, fell ill after travelling some distance by rail. Removed to the stationmaster's house at Astapovo, he died there on the 20th November. The Holy Synod inhibited all religious celebrations for the excommunicated heretic.

Many English and French translations of Tolstoi's works have been published. The standard Life of him in English is that by Mr Aylmer Maude (2 vols. 1909–10), who has made many translations with introductions, and written variously on his works. See Lives by Birukov (trans. 1911), Romain Rolland (trans. 1911), Knowlson (in Eng. 1904), Staub (in Ger. 1908); various works by Lourié, including *Vie de Tolstoi* (1907); Crauford, *Religion and Ethics of Tolstoi* (1912); Tolstoi's *Diaries* (trans. 1917); the reminiscences of his son Ilya (trans. 1914), and of Gorki (trans. 1920), and *Family Views of Tolstoy* (trans. 1926); Goldenweizer, *Talks with Tolstoi*; Kropotkin's *Ideals and Realities in Russian Literature* (1905); and the relevant works cited at TURGENEV.

Toltecs. See MEXICO.

Tolu. See BALSAM.

Toluol, or TOLUENE, is a Methyl Benzene which dissolves sulphur, iodine, and many resins. It is obtained from the dry distillation of tolu or other resin, by the action of potash on benzylic alcohol, by heating toluic acid with lime, and as a coal-tar product. From it Saccharin (q.v.) may be obtained.

Tomahawk, a light war-hatchet of the North American Indians. The early ones were made of stone or of deer-horn put through a handle of wood, or fastened to the handle by sinews or cords of skin; European traders supplied hatchets of steel. The blunt side of the head was sometimes made hollow, for a tobacco-pipe.

Tomato, or LOVE-APPLE (*Solanum Lycopersicum*, or according to some, *Lycopersicum esculentum*), a plant of the family Solanaceæ. In the warmer countries of Europe, the United States, and other countries in which the summer is warm and prolonged, it has long been cultivated for the excellent qualities of the fruit as an article of diet. Although belonging to a family of plants usually regarded with suspicion on account of the powerfully poisonous properties of many of the species comprised in it, it is now recognised as one of the most important and valuable vegetables grown for human food. Though it was introduced into Britain

Large Early Red Tomato.
a, its fruit; *b*, fruit of common tomato.

as early as 1596, the consumption of its fruit there lagged as compared with some other European countries and America, but it has increased immensely since 1880. The annual supply produced in Britain is quite inadequate to meet the demand, which yearly increased as the agreeable qualities of the fruit became more widely known; consequently enormous quantities of it are imported, packed dry and in tins, the latter being chiefly used in making soups and sauces. The imported fruit, having to be packed in an imperfectly ripe state in order to reach its destination in safety, is inferior to that grown in Britain in colour, flavour, and texture; the latter, therefore, commands the highest price in the market. On this account the culture of the tomato has

developed into a distinct horticultural industry, like grape-growing and mushroom-growing. Very extensive establishments in glass have been erected at Worthing in Sussex and at other places in England and in Scotland exclusively for its culture, which proves a remunerative enterprise. The plant is annual in duration, and too tender to be grown successfully in the open air in Britain, unless it is reared in heat and grown in pots to the flowering stage under glass before the beginning of June, the earliest period at which it may be safely turned out of doors. Even then it must be planted against a wall with a warm exposure and well sheltered. The seeds are sown in February and March in a temperature of 55° to 65°. An open friable soil is essential, and the use of potash as a manure is hardly less so. Like its near relative the potato, the tomato is subject to attacks of Phytophthora (the potato-disease fungus), and the fruit is liable to a disease also of fungus origin, which causes considerable loss to inexperienced growers, but rarely attacks the plants of those who understand their treatment under glass. The wilt disease caused by the fungus *Fusarium Lycopersici* is very dangerous. If the soil is infected, rotation of crops should be tried. Varieties immune to wilt have been bred.

The fruit is cooked in a great variety of ways: broiled or fried by itself, or with meat or other accompaniments; made into soups and sauces; sliced raw, it is an excellent ingredient in salads, and eaten with vinegar and pepper and salt uncooked it is perhaps as wholesome and refreshing as in any other way. Its use in any way as food is considered beneficial in affections of the liver, indigestion, and diarrhœa. The word tomato is derived from the Spanish American name *tamate*, and the English name Love-apple has arisen from its supposed aphrodisiac properties.

Tomb (Gr. *tymbos*), a monument erected over a grave, in order to mark the resting-place, and preserve the memory, of the deceased. In early ages, and among eastern nations, it sometimes became the practice to place the remains of the dead in excavated sepulchres, whose interior was often decorated with painting or otherwise. Where the usage was to burn the dead their bones and ashes were placed in urns in these receptacles. Some of the most remarkable rock-tombs were those of Egypt. The rock-tombs of Persia and Lycia have imposing architectural façades. See also CATACOMBS, ETRURIA, PETRA.

In the Homeric poems heaps or cairns of stones are placed as honorary memorials above the graves of departed heroes. The tumulus of rude ages (see BARROW, CAIRN) is found over the greater part of northern Europe. Some see in the rectangular Egyptian mastaba with its chambers the origin of the rude megalithic tombs of a great part of the world. The Pyramids (q.v.) were the sepulchres of the Egyptian monarchs from the 4th to the 12th dynasty. The tombs of Greece, and still more those of the Greek colonies in Asia Minor, were sometimes pillars, or upright stone tablets, sometimes small buildings in the form of temples; the most celebrated was the Mausoleum (q.v.). The Roman tombs were not unfrequently important architectural structures, varying in form, but oftenest consisting of a circular tower resting on a square basement; familiar examples being the tomb of Cæcilia Metella (see ROME, p. 766), and the yet larger and more solid tomb of Hadrian, on the banks of the Tiber, best known as the castle of S. Angelo, which is about 220 feet in height, and of immense solidity. The tombs were generally erected outside the towns, and along the principal roads leading into the country, as in the Via Appia at Rome, and the Street of Tombs at Pompeii. A form of excavated tomb, without external architecture, called Columbarium (q.v.), was also in use in Rome, whose walls were pierced with cells to receive cinerary urns. The prevalent circular tomb became in the latter period of the Roman empire polygonal. In many parts of Italy, and in such Spanish-American towns as Lima and Quito, the cemeteries contain rows of niches rising above one another in terraces, honeycomb-like, and each holding a coffin, which rests there so long as the heirs pay the rent.

In the earlier centuries of Christianity the burial of the dead in churches was prohibited. The first step which led to its adoption was the custom of erecting churches over the graves of martyrs; then followed the permission to kings and emperors to be buried in the church porch. The most important tombs of the middle ages are generally within churches or cloisters. The earlier examples consist of a simple stone coffin, or sarcophagus, often with a low gabled lid and a sculptured cross. An altar-tomb, or tomb in the form of a table, followed; and in the 13th century a species of tomb was introduced, consisting of a sarcophagus, on which rests a recumbent figure of the deceased, the whole being surmounted by a canopy, often of exquisite symmetry and richness (see illustration at CANOPY). The tombs of the Scaligers at Verona, with their beautiful wrought-iron railing, are famous. In the renaissance period of art the tombs became more and more complex. The sarcophagus was disguised, or made the least important part of the monument; the representation of the deceased was confined to a medallion likeness, and the most prominent part of the tomb was composed of sculptured upholstery, and groups of symbolical and eventually mythological figures. In some of the 16th-century examples, as Michaelangelo's tombs of Giuliano and Lorenzo de' Medici, at Florence, the inappropriateness of the design is partly redeemed by the beauty of the figures; but in the succeeding centuries the vicious taste of these monuments rapidly increased, till it culminated in some of the hideous tombs that disfigure Westminster Abbey and St Paul's. The latter half of the 19th century witnessed a reaction, however, and much beautiful sculptured work has been produced since (see SCULPTURE). See also the articles BURIAL, CEMETERY.

Tombac, a name given to an alloy of copper and zinc like Prince's Metal (q.v.), or to an alloy of copper and arsenic.

Tombigbee. See ALABAMA.

Tomi. See OVID.

Tompkins, DANIEL D. (1774–1825), was vice-president of the United States from 1817 to 1824, but is most noteworthy for his energetic organisation of the militia of New York State—of which he was governor from 1807 to 1817—during the war with Great Britain.

Tomsk, a town of western Siberia, on the Tom, a tributary of the Obi, 2809 miles E. of St Petersburg. On or near the trade-route, and connected by a branch-line (54 miles) with Irkutsk and the Siberian railway, it has long been the seat of an important transit trade. Leather and carriages are manufactured; and a university was established in 1888 (see SIBERIA). Great part of the town was burned in 1890. Pop. 90,000.

Tom-tit. See TIT.

Ton, the same word as Tun (q.v.), denotes a weight of 20 hundredweight. In Britain the hundredweight contains 112 lb., so that the ton contains 2240 lb. In the United States the hundredweight is sometimes reckoned at 100 lb., and the ton (the 'short' ton) at 2000 lb. The metric

ton is 1000 kilograms or 2204·6 lb. avoirdupois. Ton is also a measure of capacity, varying with the substance measured—timber, wheat, gravel, lime, coke, &c. For the ton used in measuring ships, see TONNAGE.

Tonalite, an igneous rock, having a granitic structure, and composed essentially of plagioclase, biotite, and quartz. Hence it is simply a quartz-mica-diorite.

Tonawanda, North Tonawanda, two adjacent cities of New York, on the Niagara River and Erie Canal, 8 miles N. of Buffalo by rail, with great ironworks and other manufactories, with power from Niagara Falls, and extensive docks. Pop. (1920) Tonawanda, 10,068; North Tonawanda, 15,482.

Tonbridge, formerly TUNBRIDGE., a market-town of Kent, 29½ miles SE. of London, stands on the Medway, which here divides into six streams, one of them called the Tun. A castle, originally Norman, but largely rebuilt in 1280–1300, and held successively by Fitz-Gilberts, De Clares, Audleys, and Staffords, retains a fine Early Decorated gate-house. The parish church, also Decorated in style, was almost rebuilt in 1878; and the grammar-school, founded in 1553 by Lord Mayor Sir Andrew Judd, occupies handsome buildings of 1865. It was remodelled in 1880. The manufacture of toys, boxes, and other articles in 'Tunbridge ware' (a kind of wood mosaic in veneer) is a specialty. The county cricket ground is the nursery for Kent cricket. A sports ground of 50 acres and a beautiful river walk belong to the town. Pop. 16,000.

Tone, in Music. See INTERVAL. For the Gregorian Tones, see PLAIN-SONG.

Tone, THEOBALD WOLFE, Irish patriot, was born the son of a coach-maker in Dublin, 20th June 1763. He had his education at Trinity College, Dublin, entered the Middle Temple, and was called to the bar early in 1789. But he soon plunged into political intrigues, acted some time as secretary of the Catholic Committee, and had a large share in the organisation of the United Irishmen. His active mind was impatient of constitutional methods, and from an early period of his career he dreamt of foreign invasion as the remedy. Naturally he found it necessary to take refuge, first in America, next in France. He laboured incessantly to induce the Republican government to take up the scheme of an invasion of Ireland, and held a command in the unlucky expedition under Hoche. In 1798 he again embarked in a small French squadron, which after a fierce fight was captured. Tone was taken to Dublin, tried, and condemned to be hanged as a traitor. He cut his throat in prison, 19th November 1798. His autobiography, edited by his son, an officer in Napoleon's army, and afterwards in the United States service, appeared at Washington in 1826. It is an interesting revelation of a mind of remarkable activity, and a character ruined by inordinate self-esteem and reckless unscrupulousness.

See his *Autobiography* (new ed. 1920); his *Letters* (ed. B. Hobson, 1920); the Life in Dr Madden's *United Irishmen* (3d series, vol. i. 1846); and, as an antidote, two papers by the Duke of Argyll in the *Nineteenth Century* for May and June 1890.

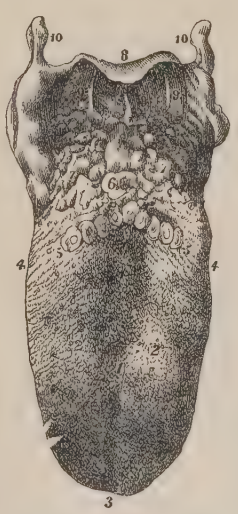
Tonga. See FRIENDLY ISLANDS.—Tonga Bay is a small inlet on the east coast of Africa, bounded on the N. by Cape Delgado.—Tongaland is a district on the east coast of Natal, north of Zululand.

Tongariro. See NEW ZEALAND.

Tongking, TONQUIN, or TONKIN, since 1884 a French protectorate, is the north-east portion of the Indo-Chinese peninsula, bordering on China; area, 40,000 sq. m.; pop. 7,400,000 (90 per cent. Annamese; the rest hill-tribes—Thai, Muong, Meo, &c.). Tongking is under more direct French administration than Annam (q.v.), of which it used to be part. The north and west are mountainous, with peaks of 9000 and 10,000 feet. The Red River (Song-cai or Hong-kiang), with its tributaries the Black and the Clear River, traverses Tongking, forming a vast delta, also entered by the Thai-binh. This delta is crossed by many canals and great dykes, whose tops serve as roads. Constant silting and floods (caused by monsoons and reckless destruction of forests by highland tribes) endanger navigation and cultivation. Rice is the chief crop. Minor products are maize, sugar, tea, coffee, fruits, cotton, silk, ramie, oil, tobacco. Tongking is rich in minerals, hitherto little exploited. Coal is worked at Hongay, near Haiphong; lignite near Ninh Binh; other minerals are tin, zinc, lead, iron, copper. Saw-milling, weaving, cement and soap making, carving and curio-making, and fishing are among the principal industries—largely in Chinese hands. The capital, Hanoi (q.v.), is connected by rail with the chief port, Haiphong, with Vinh in Annam, with Dong-dang on the Kwang-si border, and with Laokay and Yunnan-fu *viâ* the Red River Valley. For historical and other matters, see ANNAM; also Cunningham's *The French in Tonkin and South China* (1902).

Tongres, a very ancient episcopal city of Belgium, in the province of Limburg, 12 miles NW. of Liége. The church of Notre Dame was built in 1240, but its cloister dates from the 10th century. There is a mineral spring in the vicinity, mentioned by Pliny. Pop. 10,000.

Tongue, a symmetrical, muscular organ, extending from the hyoid bone upwards and forwards to the lips in front, and occupying the buccal cavity. The superior surface, borders, and anterior third of the inferior surface are free; elsewhere it is attached to adjacent parts by the investing mucous membrane and subjacent structures. At certain points this membrane forms distinct folds, containing fibrous or muscular tissue, which act to a certain extent as ligaments to the tongue. The most considerable of these folds is termed the *frænum* (or bridle) of the tongue, and connects its anterior free extremity with the lower jaw. It acts as a strong ligament, and limits the backward movement of the tip of the tongue. In very rare cases this ligament extends abnormally to the tip, so as to interfere with speech and mastication, and the child is said to be 'tongue-tied;' recourse must be then had to division of the frænum, popularly known as 'cutting the tongue.' Other folds of mucous membrane pass from the base of the tongue to the epiglottis; while from the sides of the base, passing to the soft palate, are seen two folds on either side, the 'pillars of the fauces' (see PALATE). The superior surface of the tongue is divided



Upper Surface of Tongue: 1, mesial line; 2, 2, lateral parts; 3, tip; 4, 4, sides or edges; 5, 5, V-shaped mass of circumvallate papillæ; 6, foramen cœcum; 7, mucous glands; 8, epiglottis; 9,9,9, frœna epiglottidis; 10, 10, greater horns of hyoid bone. (From Sœmmering.)

into two symmetrical lateral parts by a median longitudinal furrow, commencing at the tip, and extending back about two-thirds of the tongue's length. The various kinds of papillæ on their surface are described in the article TASTE. At the back of the surface, just behind the circumvallate papillæ, are large mucous glands, extending into long and capacious canals, and helping to secrete the fluid that moistens the tongue. On the inferior surface the longitudinal furrow, which extends from the tip to the frænum, is deeper than on the upper surface; on each side of it veins are seen running forwards; and immediately beneath the tip is a cluster of mucous glands, known as the glands of Nuck (their discoverer in 1690). The posterior extremity, or base, is flattened and extended laterally before it is inserted into the hyoid bone (known also as the lingual or tongue bone), which, with certain ligaments, must be regarded as the basis or framework of the tongue. The muscles of the tongue are usually divided into two groups—viz. the extrinsic muscles, which attach the tongue to certain fixed points external to it, and move it on them; and the intrinsic muscles, which pass from one part of the tongue to another, constitute its chief bulk, and move it on itself. These intrinsic muscular fibres run vertically, transversely, and longitudinally, and are so interlaced as mutually to support one another, and to act with the greatest advantage. By the action of the various muscles, the upper surface of the tongue may be made concave or convex, or may be pressed against the roof of the mouth; the tip may be protruded straight out or laterally, upwards and downwards, and into any recess. The organ is freely supplied with blood, mainly by the lingual artery, which is given off by the external carotid. With regard to the nerves, the glosso-pharyngeal and certain branches of the third division of the fifth nerve are concerned in the special sense of taste; other branches of the fifth nerve are concerned in ordinary sensation, while the hypoglossal nerve on each side is the motor nerve of the tongue.

The tongue in mammals does not differ very materially from that of man; but in general there is a close coincidence both in size and form between this organ and the lower jaw. In the rodents the tongue has a wedge-like shape. In the giraffe and the ant-eater the tongue is much prolonged, being an important prehensile organ in the former, while in the latter it is driven into ant-hills, and the victims are secured by its viscid secretion. In the feline races the conical papillæ are converted into recurved spines of great size and strength, which the animal uses in scraping bones and in combing its fur. Outside of the mammalia taste-buds are seen on the tongues of some reptiles and even among frogs and fishes, but in the latter they are not confined to the mouth. The functions of the tongue are gustation, prehension (in man and monkeys this function is supplied by the hand), mastication, insalivation, deglutition, and speech; to which may be added spitting and whistling, and insect-catching in animals like frog and chamæleon.

The Gasteropoda are provided with a very singular apparatus known as the tongue (though, of course, there is no homology), and consisting generally of a thin membrane, long and narrow, and rolled, except at its anterior extremity, into a tube; this membrane is covered on its upper surface with transverse rows of minute teeth, or more commonly with plates having tooth-like siliceous projections. The function of this organ is trituration of food. In insects a certain oral appendage is described as a *lingua*.

In its medical relations the tongue is of great importance as an index to the condition of the system, and particularly of the digestive organs; its appearance, whether firm or flabby, moist or dry, clean, furred, or unduly red and bare, is a valuable guide both as to the diagnosis and treatment of disease.

Amongst the diseases of the tongue may be mentioned *Inflammation* or *Glossitis*. The most marked characteristics of this affection are great swelling, tenderness, and difficulty in speaking and swallowing. It rarely occurs as an idiopathic or spontaneous affection, but often used to accompany severe salivation. It must be treated by purgatives and low diet, and by gargling, as in ordinary salivation (see SALIVA). Incisions are sometimes useful, both to relieve tension, and by the depletion that ensues. Abscess in the tongue is also occasionally met with.

Hypertrophy, or persistent enlargement of the tongue, sometimes seems to result from an imperfectly cured inflammation, but is probably in most cases congenital, although perhaps not noticed for a year or two. It sometimes attains an enormous size, but can generally be relieved by operation, at least in its earlier stages. A good deal of attention has been given during recent years to a condition called *leucoplakia*, consisting in whitish spots or patches on the surface of the tongue, very chronic in their course, often traceable to some irritation, particularly smoking, and especially important because they not infrequently become the seat of cancer. One of the most common forms of disease of the tongue is *ulceration*, which may arise (1) from the irritation of a decayed tooth with a sharp jagged edge; or (2) from constitutional syphilis; or (3) from a disordered condition of the digestive organs. In the first case the tooth or its edge must be removed; in the second iodide of potassium with sarsaparilla should be tried; and in the third the complaint generally yields to regulation of the diet and of the digestive organs. *Cancer* is by far the most common tumour met with in the tongue, and is nearly always of the epithelial variety. It is frequently connected with some cause of irritation—e.g. from a broken tooth, or from excessive smoking—and is very much more common in men than in women. It is in general a rapidly fatal form of cancer; and operations for its removal, always serious, are less often followed by immunity than in some other organs. See Butlin, *Diseases of the Tongue* (1885).

Tonic, in Music. See KEY.

Tonics are medicines which, in cases of want of *tone* in the system, are employed to restore its strength and vigour. Tonics, to a certain degree, are stimulants; but while the latter produce a rapid but transitory excitement, the former slowly induce a certain degree of excitement, and the effect is permanent. Most tonics, in which category we must place the shower-bath, cold sea-bathing, open-air exercise, friction, &c., as well as drugs, act primarily through the nervous system, and secondarily produce their effects upon the system at large. It is of course of the greatest importance to ascertain to what defect in the system the loss of tone is due; whether to poorness of blood, to weakness of the heart, to defective digestion or excretion, or to enfeeblement of the nervous system generally. Otherwise the measures employed, while suitable in one of these conditions, may be very harmful if used in another. Amongst the chief medicines of this class are the dilute hydrochloric, nitric, nitro-hydrochloric, and phosphoric acids, various preparations of iron and arsenic, the various kinds of cinchona bark, with their alkaloids and their salts, cusparia, calumba, cascarilla, chiretta, gentian, quassia, and taraxacum, and generally most vegetable bitters. Although nux vomica and its alkaloid strychnine are placed

by writers on Materia Medica amongst the 'special stimulants,' when given in very small doses they have a well-marked tonic action; and there is probably no tonic medicine of more general utility than the *Syrup of Phosphates of Iron, Quinine, and Strychnine* (Easton's Syrup), a non-official but widely-used preparation, of which every drachm (the ordinary dose) contains $\frac{1}{32}$ of a grain of strychnine.

Tonic Sol-fa. See SOL-FA SYSTEM.

Tonka Bean, the seed of *Dipteryx odorata*, a large tree of the family Leguminosæ, sub-family Papilionaceæ, a native of Guiana, having pinnate leaves and axillary racemes of purplish flowers. The fruit is an oblong, dry, fibrous pod, containing a single seed, which has a strong, agreeable odour, owing to the Coumarin (q.v.) which it contains, and which is sometimes found crystallised between the cotyledons. Tonka beans are used for flavouring snuff, and are put amongst clothes to preserve them from insects, and to communicate an agreeable odour. They are also, by a natural confusion, often called Tonquin Beans.

Tonkin. See TONGKING.

Tonle-Sap ('Great Lake'). See CAMBODIA.

Tonnage, of ships, is a measure of cubical capacity, and of weight. The term may have reference to 'register,' 'deadweight,' 'displacement,' 'freight,' or other tonnage. From very early times some method must have been employed to determine the relative capacity or carrying power of different vessels, and the term 'tonnage' can be traced back for at least 500 years. In Britain the first Act of Parliament dealing with the subject was passed in 1422. Further laws were introduced in 1648, 1694, and in 1720, but the application of these was limited to particular classes of ships, or those employed in particular trades.

The first legal system of measurement having general application to all classes of merchant-ships was introduced in 1773, and is known as 'Builders' Old Measurement.' Long before its legal enforcement, however, it had become the established practice of British shipbuilders, although not applied in an exactly uniform manner. The rule was to multiply the length (minus three-fifths of the breadth) by the breadth, the product by half the breadth, and divide by 94, the quotient expressing the tonnage. During the long period prior to the 19th century, when naval architecture made little progress, and types of ships and methods of construction were almost stereotyped, this system seems to have answered its original purpose—i.e., roughly expressing the 'dead-weight' carrying power of ships. But with the growth of shipping, and the legal assessment of dues according to the tonnage computed by this system, various methods of evasion were resorted to, the effects of which were most hurtful to true progress in ship architecture. The rule only concerned itself with length and breadth, and took no account of actual form or of depth, but assumed the depth to be equal to half the breadth. Builders had therefore simply to increase the depth, leaving the length and breadth unchanged, or make the form 'fuller,' thus adding to the carrying power without in any way altering the legal and taxable tonnage. Ships were in consequence built of such excessive depth as, in many cases, to render them unsafe and unseaworthy. The inadequacy and perniciousness of this system of measurement were only slowly recognised, and it remained in force until 1836, when a 'New Measurement' law was substituted. This law required certain measurements to be taken to determine the internal capacity of a ship, but the object was easily evaded.

The new measurement gave place in 1854 to 'register' tonnage, the system which, with minor modifications, is still in force as the legal measurement upon which dock, harbour, light, and other dues are assessed. It determines, in an accurate manner, the entire internal capacity in cubic feet of a ship. At suitably placed and equidistant stations throughout the length of the ship, measurements are taken of the vertical transverse areas, and these areas are used, in conjunction with the length, to obtain the volume below the tonnage-deck. If a vessel's hull is continued above the tonnage-deck, the volume of the space is separately measured; and all closed-in spaces above the upper-deck, such as poop, forecastle, deck-houses, &c., intended for accommodation or stowage, are also calculated. The sum of all these volumes in cubic feet, divided by 100, gives the 'gross register' tonnage. A 'register' ton, therefore, is simply 100 cubic feet of space, and has only a very indirect relation to a 'dead-weight' ton of 20 cwt. avoirdupois. 'Net register' tonnage—the tonnage inscribed in the register of British Shipping—is the figure remaining after certain deductions are made from the 'gross.' It is intended to represent the space available in a ship for remunerative service, such as the stowage of cargo or the accommodation of passengers. In sailing-vessels the deductions are very small, representing chiefly the spaces for the crew. In steamers and motor-ships the case is very different, for not only the crew-spaces, but those occupied by the engines, boilers, bunkers, water-ballast, &c., are deducted. The question of deductions has all along presented many difficulties and anomalies, and the original law had to be amended to obviate these. On the whole, however, the principle on which the present system of tonnage measurement is based has served the purpose, and during the years it has been in force comparatively few changes have had to be made. It has been adopted by the principal maritime nations and by various international commissions. Alternative systems of measurement, such as 'dead-weight' tonnage, and 'displacement' tonnage, have been advocated from time to time when inequalities have been found to press specially hard, but none have found entire favour.

'Displacement' tonnage is by general consent regarded as the fairest measure for the tonnage of warships, since they are designed to carry certain maximum weights and to float at certain load-lines which are fixed with reference to the character of service. It has for many years been the official tonnage for the warships of most nations, and since 1872 the tonnage of British warships has been the displacement.

'Freight' tonnage, a system of measurement sometimes employed by merchants and shipowners, in connection with stowage (although it has no legal authority), is simply a measure of cubical capacity. A freight ton, or 'unit of measurement cargo,' simply means 40 cubic feet of space available for cargo, and is therefore two-fifths of a 'register' ton. It is a purely arbitrary measure, based on the assumption that 40 cubic feet are required to stow a ton weight.

In connection with yachts, the rule most generally adopted is known as the 'Thames Rule,' and is simply a slight modification from the B.O.M. tonnage.

Tonnage and Poundage. See TUNNAGE AND POUNDAGE.

Tonquin. See TONGKING.

Tönsberg, one of the oldest of Norwegian cities and seaports, 71 miles SW. of Oslo by rail, exports whale-oil, margarine, and pitch; its shipping includes many whalers. Pop. (1920) 12,568.

Tonsils. See PALATE.—Tonsilitis (or *Tonsillitis*) is inflammation of the tonsils, a form of sore throat varying much in intensity; see THROAT.

Tonson, a family of London booksellers in the first half of the 18th century. Its founder, Jacob Tonson, the son of a barber-surgeon, was born in 1656, apprenticed in 1670, and commenced business early in 1678 with a capital of £100. Before 1679 he published some plays of Otway and Tate, and as early as 1681 he had secured the patronage of Dryden. In 1700 he published Dryden's *Fables*, and soon after bought a country-house near the village of Barnes, where as secretary he entertained for many years the members of the famous Kit-Cat Club (q.v.). Tonson was also the first to open Shakespeare to the reading public by producing Rowe's octavo edition in 1709. After 1706 he published some of Pope's works. Tonson had his brother in partnership, and afterwards his nephew, and on his death at Ledbury, April 2, 1736, was succeeded by his grand-nephew, Jacob Tonson the third, who died in 1767. See Charles Knight's *Shadows of the Old Booksellers* (1865).

Tonsure (Lat. *tonsura*), a religious observance of the Roman Catholic and Oriental churches, which consists in shaving or cutting part of the hair of the head as a sign of the dedication of the person to the special service of God, and commonly to the public ministry of religion. By some writers it is represented as of apostolic origin (cf. Acts, xxi. 24); but that it did not prevail in the early ages is sufficiently plain. It would appear that the usage first arose in reference to the monastic rather than the clerical life. Paulinus of Nola, in the end of the 4th or beginning of the 5th century, alludes to it as then in use among the western monks; and it speedily passed from them to the clergy, the crown-like figure being regarded partly as a symbol of our Lord's crown of thorns, partly as an emblem of the 'Royal Priesthood' of the Christian dispensation. The form of the tonsure was different in different churches, and the varieties of it are of some historical interest. That of the Roman Church, called 'the tonsure of Peter,' consisted in shaving the crown as well as the back of the head, so that there remained a circular ring or 'crown' of hair. This was the form in use in Italy, Gaul, and Spain. In the 'Scottish (or Irish) tonsure,' which was in use in early Britain, in Ireland, and in those parts of Germany in which the Irish missionaries had preached, the entire front of the head was shaved, leaving the front bare as far back as the line from ear to ear. This tonsure was called 'the tonsure of James,' and by its enemies that of 'Simon the Magician.' The Greeks and other Orientals shaved *the entire head.* The supposed derivation of the Irish form of tonsure from the apostolic times led to its being held both in Ireland and in Britain, as well as other churches of Irish foundation, to be of the most vital importance. It was in use in the parts of England converted by Scottish missionaries, and was the subject of a violent controversy decided at Whitby in 664 in favour of the Roman usage (which triumphed also in regard to Easter and other peculiarities of the Celtic Church). The tonsure of some monastic orders and friars still leaves but a circle of hair: but the tonsure of secular clergy is quite small. The right to tonsure is with bishops, mitred abbots, cardinal priests, and certain priests with special privilege. Originally the tonsure was merely a part of the ceremonial of initiation in orders, and was only performed in the act of administering the higher order; but about the 7th century it came to be used as a distinct and independent ceremonial; tonsure is not an 'order,' but only a 'preparation for orders.'

Tontine, a term derived from the name of Lorenzo Tonti, a Neapolitan, who settled in Paris in Cardinal Mazarin's time, and proposed in 1653 to raise a fund of twenty-five million livres for the relief of the national exchequer by means of a financial association, of which the great prize should ultimately accrue to the longest liver. There were to be shares of 300 livres. The subscribers were to be divided into ten classes according to age; and for each class a fixed sum was annually to be divided equally amongst the members of the class. In this way, while each member should get fair interest from the first on his capital, the profit falling to survivors would increase as years went on, and the last survivor would receive the whole of the interest due to the class he belonged to. Mazarin and Tonti were both Italians, and regarded in Paris with suspicion, and, in spite of the cardinal's support, the scheme fell through. Tonti for a time received a pension, and was an active promoter of companies; but was ultimately committed to the Bastille, whence he for some years corresponded with his friends. There he seems to have died. But in 1689–92 Louis XIV., sorely in need of money, reverted to the plan of the Italian adventurer, and raised a sum of fourteen million livres by a tontine of forty years' duration. The sole survivor was in 1726 drawing an annuity of 73,500 livres on his original share of 300 livres. The tontine is a lottery of annuities—or compound of lottery and annuity—and was frequently had recourse to in France in the 18th century, with government sanction. Generally, in an association on what is called the tontine principle, a payment is made by each member of the association, and with the capital so formed an annuity, payable at the same rate until all the lives forming the association are extinct, is bought from some company or individual. This annuity is divided among the members according to age and premium paid by each; and on the decease of any member the surplus thence arising is divided among the survivors, and on the death of the last member of the association the total annuity reverts to the source from which it has hitherto emanated. There are various kinds of tontines; and the designation of tontine may, with propriety, be applied to any financial scheme by which it is proposed that gain shall accrue to survivorship.

In Britain tontines have been less popular than in France, but both in England and Ireland these were often established. Three Irish tontines in 1773–77 had 3500 members. The last public one in England was in 1789. In Great Britain they were chiefly set on foot not for purposes of public finance, but to enable a number of small capitalists to build hotels and the like, requiring sums beyond what any one of them singly could raise. Such a tontine was founded at Peebles in 1807; 144 members subscribed £25 each, and risked his share not on his own life, but on any life he chose to name—usually a healthy young child. The persons so named had diminished from 144 to 53 by 1864, and to 11 in 1880; in 1887 the shareholders, reduced by death to two, sold their shares for £2130. In 1871 it was proposed to organise a tontine to take over the Alexandra Park and Palace, but the scheme came to nothing. The United States has had its tontines also: the New York Tontine Association, founded in 1790, was wound up in the years 1870–78. See articles in *All the Year Round* (February 1873) and *Chambers's Journal* (March 1880).

We occasionally hear of Tontine Clubs where the original members have the advantage that the last 100 survivors of their number become proprietors of the Club. The system is a feature of many American insurance societies (see INSURANCE).

Tooke, JOHN HORNE, was born 25th June 1736, in Newport Street, Westminster, the third son of John Horne, a well-to-do poulterer. He was educated chiefly at Westminster and Eton (where a schoolfellow's pen-knife destroyed the sight of one eye), and then at St John's College, Cambridge. Taking his B.A. in 1758, he entered at the Middle Temple, and for a time was an usher at Blackheath, but in 1760, to please his father, accepted the living of New Brentford. He had neither liking nor reverence for the clerical profession, and dropped it during two travelling tutorships (1763–65); at Paris he met John Wilkes, and conceived the strongest admiration for him. When in 1768 Wilkes stood for Middlesex 'Parson Horne' pledged his credit for his expenses, and vowed that 'in a cause so just and holy he could dye his black coat red;' but ere long they fell out, and in 1771 had a rasping epistolary controversy. Horne, however, who in 1770 had composed the famous (unspoken) speech of Lord Mayor Beckford to the king, still continued to meddle in politics, and even encountered, not without success, the formidable 'Junius.' In 1773 he resigned his living, and resumed the study of law. About this time his spirited opposition to an enclosure bill procured him the favour (*plus* £8000) of the rich Mr Tooke of Purley in Surrey; and to this were due both his assumption in 1782 of the surname Tooke and the sub-title of his *Epea Pteroenta, or the Diversions of Purley* (2 parts, 1786–1805), that witty medley of etymology, grammar, metaphysics, and politics, which he commenced during an imprisonment in the King's Bench for promoting a subscription for the Americans 'barbarously murdered at Lexington by the king's soldiers in 1775.' In 1779 he found himself debarred from the bar by his orders; in 1790, and again in 1797, stood unsuccessfully for Westminster; in 1794 was tried for high-treason, but acquitted; and in 1801 obtained a seat for the rotten borough of Old Sarum, only, however, to be excluded by a special act from the next parliament (see CLERGY). He died at Wimbledon, his home for the last twenty years, on 18th March 1812, bequeathing his property to his natural children.

See the Lives by A. Stephens (2 vols. 1813), and Miss Yarborough (1927); and Thorold Rogers, *Historical Gleanings* (2d series, 1870).

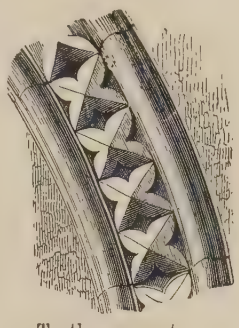
Toole, JOHN LAWRENCE, the most popular low-comedian of his day, was born in London on 12th March 1832. Originally intended for city life, he soon gave up the desk and became an actor. He first played at Ipswich, then served an apprenticeship in the provinces, making a great reputation for himself in Edinburgh, Glasgow, and Dublin. He made his first appearance in London at the St James's Theatre in 1854, and played afterwards at the Lyceum with Charles Dillon, at the Adelphi under the management of Benjamin Webster, and at the ill-fated Queen's Theatre in Long Acre. In 1874–75 he played in the United States, and in 1890 in Australia. In 1879 he became lessee of the Folly Theatre, which he enlarged, changing the name to 'Toole's Theatre.' See his *Reminiscences*, chronicled by Joseph Hatton (1888). He retired in 1896, and died 30th July 1906.

Tooley Street, a street in Southwark, at the foot of London Bridge, derives its name from a corruption of St Olave, a church here, and is famous through Canning's story of its three tailors who began their petition to parliament with 'We, the people of England.'

Toombudra (correctly, TUNGABHADRA), an important tributary of the Kistna or Krishna, rises in the south-west of Mysore, and after a north-east course of 400 miles joins the Kistna 16 miles below Karnul.

Toothache. See TEETH, DENTISTRY.

Tooth-ornament, a form of sculptured enrichment much used in the Early English style.



Tooth-ornament.

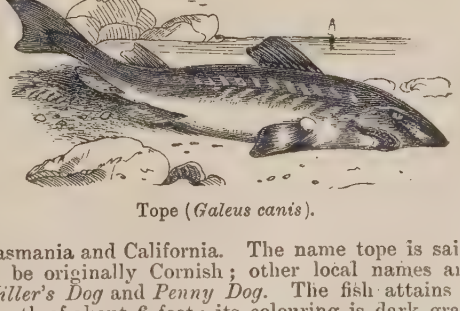
Tooth Powder. See TEETH.

Toothwort, a name for the orobanchaceous *Lathræa squamaria*, one of the Insectivorous Plants (q.v.), parasitic on hazel and other tree roots; as well as for the cruciferous *Cardamine bulbifera*, also known as 'coral-wort' and 'tooth-violet.'

Toowoomba, a town of Queensland, in an agricultural and wine-growing district of the Darling Downs, 70 miles W. of Brisbane; pop. with suburbs, 25,000.

Topaz, a mineral, ranked by mineralogists amongst Gems (q.v.), the finer varieties of which are much valued both for their lustre and the beauty of their colours. In chemical composition it is a fluoriferous silicate of aluminium, usually with a little oxide of iron. It is found generally in acid igneous rocks, and in many parts of the world—Russia, Siberia, Saxony, Australia, the United States, Cornwall, Aberdeenshire, the Mourne Mountains in Ireland—but those most prized by jewellers are generally from Brazil. Topaz may be colourless, light blue or green, rose-pink, orange, or straw-yellow, in great variety of shades. Its crystals are rhombic prisms, generally terminated by four-sided pyramids, but often variously bevelled and acuminated. The prisms are finely striated. The specific gravity is about 3·5. Topaz is translucent or almost transparent on the edges, and is harder than quartz. It is rendered very electric by heat or friction, and by this property a topaz may at once be distinguished from a diamond or ruby, for which otherwise, when cut and set, it might readily be mistaken. A coarse variety of topaz called *Pyrophysalite* occurs near Fahlun in Sweden, which is nearly opaque; when reduced to powder it can be used as emery for grinding and polishing. The so-called 'oriental topaz' is a yellow corundum; the 'false topaz' is a yellow variety of vitreous quartz.

Tope (*Galeus canis*), a small species of shark abundant on the southern coasts of Britain, more rare towards the north. Its range extends to



Tope (*Galeus canis*).

Tasmania and California. The name tope is said to be originally Cornish; other local names are *Miller's Dog* and *Penny Dog*. The fish attains a length of about 6 feet; its colouring is dark gray above, white below. Numerous young—a score or more—are born viviparously at a birth. In France

and Italy the tope is sometimes eaten either fresh or after drying; the liver is also used for oil. The tope is extremely troublesome to fishermen, robbing their lines of the fish which are attached to them, and biting off the hooks, or, if it happens to be itself hooked, often winding the line round its body in many coils and with tangled knots.

Tope (Pâli *thûpo;* Sansk. *stûpa*, 'a mound'), a Buddhist tumulus for the preservation of relics, of more or less solid masonry, in which the relics were deposited. The oldest topes are spherical; others have polygonal bases; and they were originally crowned with an umbrella-shaped finial, and surrounded by a carved stone railing with elaborately carved gateway. The chief one of a great group at Sanchi near Bhilsa (q.v.), in Central India, is 42 feet high and 106 feet in diameter. In Ceylon they are called dâgobas; the term, from Pâli *dhâtu-gabbha*, denotes properly the relic-receptacle within the tope, but is regularly used to mean the whole structure; there is an illustration of one in the article CEYLON. Some topes are rock-cut. See also INDIA, p. 108.

Topee. See TANTIA TOPEE.

Tope'ka, the capital of Kansas, is on both banks of the Kansas River, 67 miles W. of Kansas City by four great railways. It is well built, with wide, shady streets, and possesses a handsome capitol building and a Congregational college; while close by are the state asylum for the insane and the reform school. Topeka is the seat of an Episcopal bishop. It has flour-mills, large railway-shops, several foundries and packing-houses, &c. Founded in 1854, it became the state capital in 1861. Pop. (1920) 50,022.

Topelius, ZACHRIS (1818–98), Swedish-Finnish poet. See SWEDEN (*Literature*).

Töpffer, RODOLPHE, artist and novelist, was born the son of a painter at Geneva, January 31, 1799, and himself studied art, but was obliged by the weakness of his eyes to become a teacher. He founded a boarding-school in 1825, and conducted it till his death, was named in 1832 professor of Rhetoric at the Geneva Academy, and died 8th June 1846. His name is widely known from the delightful *Nouvelles Genévoises* (1841), and from the exquisite little masterpiece of sentiment and fancy, *La Bibliothèque de mon Oncle* (1832). Other novels are *Le Presbytère* (1833) and his last and unfinished work, *Rosa et Gertrude* (1846). Töpffer had a genius for humorous caricature, and the drawings in his two series of *Voyages en Zig-zag* (1843–53) are almost better than the text.

See the Lives by Relave (1886), and Blondel and Mirabaud (1887); also Rambert, *Écrivains nationaux Suisses* (vol. i. Geneva, 1874). See Sainte-Beuve, *Portraits Littéraires*, vol. iii., and *Portr. Contemporains*, vol. iii.

Tophané, a suburb of Constantinople (q.v.).

Tophet. See GEHENNA.

Topknot, the popular name of some small fishes of the same genus as the Turbot (q.v.) and brill. A typical representative is *Rhombus punctatus*, a fish about 6 inches in length and 4 in breadth. It occurs on British and other northern European coasts, living among rocks and seaweed, with which the brown colour spotted with black harmonises well.

Toplady, AUGUSTUS MONTAGUE, hymn-writer, was born at Farnham in Surrey, November 4, 1740, and had his education at Westminster and Trinity College, Dublin. He had been awakened at fifteen in an Irish barn, but it was three years more before he had 'a full and clear view of the doctrines of grace.' He took orders in 1762, and became vicar of Broad Hembury, Devonshire, in 1768. During the last three years of his life he preached in a chapel near Leicester Fields in London; and here he died, August 11, 1778. A strenuous defender of Calvinism, he was a bitter controversialist, and is not sparing in terms of abuse, even of Wesley himself. His work, *The Church of England Vindicated from the Charge of Arminianism* (2 vols. 1769), is safely forgotten, as it deserves to be; but his name survives secure of immortality in a hymn like 'Rock of Ages.' As early as 1759 he had published at Dublin *Poems on Sacred Subjects;* his *Psalms and Hymns* (1776) was a collection, with but few of his own. The best edition of his whole verse is that by D. Sedgwick (1860); of his entire works collections were published in six vols. in 1794 and in 1825. See Bishop Ryle's *Christian Leaders* (1869), and a Life by T. Wright (1912).

Töplitz. See TEPLITZ.

Topolias, or COPAIR. See BŒOTIA.

Top-shell. See TROCHIDÆ.

Toptani, a powerful Albanian family. See ESSAD, ALBANIA.

Torbanehill, Torbanite. See BOGHEAD COAL.

Torbernite, a highly radio-active, bright-green mineral found in Cornwall and elsewhere, is a phosphate of copper and uranium, crystallising in tetragonal plates with perfect basal cleavage.

Torfæus. See ICELAND (*Literature*).

Torgau, a town of Prussia, till 1889 a fortress of the second rank, stands on the left bank of the Elbe, 70 miles SSW. of Berlin by rail. The river is here crossed by an old bridge and a railway bridge. Among the public buildings are the castle, containing a church consecrated by Luther in 1544; a town-church, with pictures by Cranach, and the grave of Luther's wife; and an old town-hall. Here on 3d November 1760 Frederick the Great defeated the Austrians. Pop. (1925) 12,616.

Torilis. See CAUCALIS.

Torino. See TURIN.

Tormentil. See POTENTILLA.

Tormentum, an engine for throwing missiles. See BALLISTA, CATAPULT.

Tormes, LAZARILLO DE. See MENDOZA, NOVELS.

Tornado. See STORMS.

Torneå (Finnish *Tornio*), a town in the Finnish government of Uleåborg, at the mouth of the Torneå River, which, rising in the Torneå lake, forms during great part of its course of 250 miles the boundary between Sweden and Finland; pop. 2000. Across the river is the Swedish town of Haparanda, through which the Finnish and Swedish railways are linked.

Tornillo. See MEZQUITE.

Toro, a town of Spain, on the right bank of the Douro, 20 miles E. of Zamora by rail; pop. 8000.

Torontál, a Hungarian county on the Maros and Theiss, with Nagy-Becskerek for capital, was divided in 1919 between Yugoslavia and Rumania, Yugoslavia getting most of the territory, with Veliki Bečkerek (Nagy Becskerek) and Veliki Kikinda (Nagy Kikinda), Rumania a north-eastern slice.

Toronto, second in importance among Canadian cities, and capital of the province of Ontario, stands on the northern shore of Lake Ontario, north of the mouth of the Niagara River, and has thus extensive water communication east and west. The development of its 10-mile water-front by the Toronto Harbour Commission has been combined with the reclamation of land for public parks. Its railways, including the transcontinental lines, give great trading facilities. The name is derived

from the Huron word signifying 'place of meeting.' In 1749 the French established a chain of posts or forts through all the west and down the Mississippi Valley, and two forts, one at Kingston, Fort Frontenac, and one at Toronto, called Fort Rouillé. In 1756 this fort, on the west side of the present city, was destroyed to prevent its falling into the hands of the English. In 1793 Governor Simcoe, finding Niagara or Newark too close to the American side —indeed, right under the guns of an American fort—for the seat of government, crossed Lake Ontario and established his headquarters in a tent on a site to the east of the present city. In this tent he passed a whole winter before a government house could be erected for his use. In 1812 Toronto, called York by Governor Simcoe, was captured and burned and looted twice by the American army and navy. In 1834 it was incorporated as a city with its present name Toronto. In 1837 it was the scene of a brief and ineffectual rebellion under Lyon Mackenzie (q.v.). Since that time its history has been purely civic, without other interest than that attaching to prosperous growth. The increase of population has been rapid. In 1793, when Governor Simcoe landed, there were only two Indian families. In 1834 the population was less than 10,000. In 1861 it had increased to 44,821, in 1871 to 59,000, in 1881 to 96,000, in 1911 to 376,538, in 1921 to 521,893.

All the departments of the provincial government are centred in Toronto. It is the residence of the lieutenant-governor, whose official abode is a handsome building. The local legislature meets annually in the magnificent parliament buildings, completed in the early years of the 20th century. The Dominion government has also great establishments in Toronto in the custom-house, post-office, internal revenue offices, and a meteorological observatory. The law-courts are centred in Osgoode Hall, a very stately and roomy building.

The principal ecclesiastical buildings are the cathedral of St James (Anglican), the Metropolitan Methodist Church, and St Michael's Cathedral (Catholic). In educational institutions Toronto is very rich. The university of Toronto, which was burned to the ground in 1890, was a very imposing structure, and, restored on the old plan, is well worthy of its noble site and splendid grounds. Federated with the university are Victoria College (Methodist), Trinity College (Anglican), Wycliff College (Protestant), Knox College (Presbyterian), and St Michael's College (Catholic). There are also the Normal School, several collegiate institutes, endless public schools and separate (Catholic) schools and convents; and there are schools of pharmacy, dentistry, and veterinary science. Toronto has its Public Library (1910) with branches, University Library, and Law Library.

The factories comprise iron-foundries, engineer-shops, railway works, rolling-mills, manufactories of agricultural implements, cabinet-works and carriage-works, tanneries, soap-works, bootmaking establishments, sash and door factories, pork-packing houses, factories of men's clothing and underwear, ladies' clothing, hats, caps, and furs. The city has many advantages for trade and manufactures, including an ample supply of cheap power from Niagara Falls, about 80 miles distant. Banking is largely represented in the city; and there are numerous newspapers and periodicals published there.

Toronto became the adopted home of Sir Daniel Wilson and of Professor Goldwin Smith, and was for a time the residence of Mrs Jameson the art critic.

See the article ONTARIO; also CANADA and works there cited.

Torpedo, a genus of cartilaginous fishes of the family Torpedinidæ, related to the skates and rays. They are most remarkable for their electric organs, which lie on each side of the head (see ELECTRIC FISHES, with illustrations). The electric shock is powerful enough to kill small animals, and specimens 2 or 3 feet wide can by a single discharge disable a full-grown man. The genus, which includes about six species, is widely distributed over the Atlantic and Indian Oceans; *T. marmorata* and two others are common in the Mediterranean, and *T. hebetans* reaches the south coasts of Britain.

Torpedo. This name is given to *moving* submarine mines, by which ships may be attacked below the water-line, in contradistinction to submarine mines, properly so called, which are moored (see MINES). Their invention is attributed to Robert Fulton (q.v.) in 1805. He also invented a submarine boat. He obtained only small success, and we hear nothing more of torpedoes until the American civil war of 1861–65. Torpedoes are, or have been, of four classes, viz.:

(1) *The 'Spar' Torpedo,* which is a case of explosive on the end of a long pole, some 40 feet long at least—unless its user is content to risk almost certain death if the charge of explosive be at all adequate—which projects over the bow of a boat usually of the steam-launch class. The boat having got close to the ship attacked, the explosive charge is thrust against the ship's side below water and fired electrically or by percussion (see FUSE). There have been a few instances of its successful use in the past, notably in the American civil war and in the Franco-Chinese war of 1884, but there would be small, if any, chance of success against a ship armed with modern quick-firing guns (see CANNON) and equipped with searchlights, assuming reasonably careful watch is kept where such an attack might conceivably be possible, which normally could only be against a ship at anchor.

(2) *The Towing Torpedo.*—This is a submarine mine towed by 'Otter' gear which made it travel at distances up to about 100 yards from, and *alongside,* the towing vessel. Its chance of success in these days would be about the same as that of the Spar.

(3) *The Controlled Locomotive Torpedo.*—This is a torpedo containing its own means of propulsion, but connected with its point of departure by wires. These wires, which are unrolled by suitable means, either convey electrical power to propelling and steering engines in the torpedo, or, as in the Brennan torpedo, which was adopted by the British government in 1882 for harbour defence, were connected with powerful winding engines on shore. The wires in the Brennan were wound on two drums inside the torpedo, and the pulling of these wires off the drums by the winding engines caused the drums to revolve, and so actuated the screw-propellers. Steering was effected by varying the pull on the wires. The torpedo had a speed of 30 knots. Neither of the controlled torpedoes has been adopted for use by warships in any country; and the use of the Brennan type for harbour defence, owing to its necessarily limited range of action, has been abandoned. It shares, besides, most of the limitations of controlled submarine mines (see MINES).

(4) *The Locomotive Torpedo,* carrying its own means of propulsion, which is discharged from a tube just as a projectile is fired from a gun, whether the tube be fixed on a ship or on shore; or may be dropped from an aeroplane. There have been two forms of this type, the Howell and the Whitehead.

The Howell deserves mention, as it was nearly adopted by the United States. It depended for its motive power on a heavy flywheel which was set spinning at a very high rate by an engine *external* to the torpedo. The momentum thus

acquired by the flywheel was the only available store of power. The range possible for a torpedo so actuated was necessarily very small, but over that range it steered very straight, as the revolving flywheel was, though not designedly, also a gyroscope, and acted to keep the torpedo on a straight course somewhat in the way described hereafter.

The Whitehead Torpedo, now in use by every navy, was adopted by Great Britain nominally in 1884, but actually in 1871, when the right to use the invention was acquired, and manufacture and experiments in England commenced. It was originally suggested in principle by Captain Lupuis of the Austrian navy to Mr Robert Whitehead (1823–1905), who was manager of large works at Fiume. Whitehead commenced his experiments in 1864, but it took many years to achieve real success. Even though the principles possible of application may be well known, their actual application requires mechanical ingenuity and scientific knowledge of a high order, and the Whitehead torpedo of to-day is the result of some fifty years of experiment, experience, and alteration. There is no secret now about the principles involved ; but as there is no finality in the perfecting of war stores, there will doubtless be further improvements in details which will be kept secret as far as may be by the nation making them. Two of the main improvements which have been made in the torpedo since it became a practical success may be mentioned, as they are comparatively modern. The first is in the steering of the torpedo. Up to about 1896, when Ludwig Obry, an Austrian engineer, suggested control by the Gyroscope (q.v.), a torpedo had its vertical rudders set permanently after trial runs in which it had been found to steer a straight course ; but the torpedo had no means of correcting automatically the effect of any casual occurrence tending to deflect it from the course upon which it had been launched. A trifling unforeseen or unforeseeable deviation, especially if it should occur immediately after launching, as is most likely, will produce a large error if the range to the objective be considerable. The rapidly revolving wheel of a gyroscope, which is mounted in gymbals, has the property of maintaining constant the position in space of the plane of its revolution at the moment when revolution is impressed upon it. If, therefore, the direction of motion of the vehicle—in this case the torpedo—in which the gyroscope is mounted be altered from that which it had when the gyroscope started its revolution, the gyroscope will move relatively to the vehicle in order to maintain the plane of its revolution unchanged. This motion in the torpedo is at once communicated by very sensitive gear to a steering engine, and the deviation is corrected. The gyroscope is started spinning, by the release of a powerful spring, at the moment of launching of the torpedo. The second improvement has been in the increase of motive power. Formerly this was furnished by the expansion of air compressed to as much as 3000 lb. on the square inch. Compressed air, when released, cools rapidly as it expands, and so wastes power. The first attempts to correct this were made in 1906 by heating the air prior to expansion. The latest practice is to use the gases produced by the combustion of oil with the compressed air as it expands. The mixture of gas and oil is ignited at the moment of launching.

As to maintaining the torpedo on a level keel and at a constant depth—which may be, as may be desired, anything between 5 and 30 feet—this is, and always has been, effected by horizontal rudders which are controlled by a pendulum which moves relatively to the torpedo should the latter try to dive or come to the surface, and by hydrostatic valves which respond to alteration in pressure due to depths of water other than that for which they have been set. Both pendulum and valves act on a steering engine which actually moves the rudders.

Up to a comparatively recent time the extreme range of a torpedo was about 800 yards for effective work. It is now at least 2000 yards, and the extreme range at which the torpedo would function if it struck anything is about 20,000 yards. The speed of the torpedo at its inception was only 10 knots. It is now approximately 40 knots at 3000 yards and 30 knots at 8000 yards.

The torpedo is made of steel plate of high class, the steel of which the air vessel is made being subject to a very severe specification. It is made in three sizes, 14, 18, and 21 inches in diameter at the thickest part, and 14, 18, and 21 feet in length respectively. The torpedo (see fig.) is

cigar-shaped. The head (A) contains the explosive, formerly wet Gun-cotton (q.v.), but now trinitrotoluene (see DYNAMITE). The charges are 180, 315, and 520 lb. in the three sizes respectively. The head also carries a net-cutter and contains the 'pistol' (P), which, when the torpedo strikes its objective, is driven back and fires a detonator (see GUN-COTTON) embedded in the explosive. B is the air-chamber containing compressed air. C is the balance chamber containing the depth-control gear. D is the engine room. E is the buoyancy chamber, which also contains the gyroscope. If filled with water it will cause the torpedo to sink. The entry of water is governed by counter-gear, which works off the engine and causes a valve to open after a certain number of revolutions. When recovery of a torpedo with a charge in it is uncertain, it is usual to set the gear so that the torpedo will sink at the end of its run. Otherwise it becomes a dangerous floating mine. F is the tail carrying two screw-propellers, one in front of the other, but revolving in opposite directions to prevent the torpedo from turning round on its longer axis. It carries also the two horizontal and the two vertical rudders.

Launching Tube or Carriage from which the torpedo is discharged ; this is made of steel plate. It is placed to discharge on the broadside, and is below water in large, and above water in small, ships. It is capable of considerable traverse round a ball and socket-joint at the front, which coincides practically with the ship's side, so that the torpedo can be aimed in the required direction. There are suitable watertight doors enabling the torpedo to be inserted from the rear and then the tube to be flooded prior to discharge. The torpedo on discharge is driven out of the tube by the gases of explosion of a cartridge of Gunpowder (q.v.) or smokeless propellant (see GUN-COTTON). This cartridge is fired electrically. As the torpedo leaves the tube on discharge, a lever, projecting from it, strikes a projection in the tube and is thrown back. This starts and frees for action the various agencies inside the torpedo, rendering it, as it were, a live thing. In order to prevent the torpedo from being deflected by the violent wrench which it would receive on entering the water when discharged from a ship in motion, a shield projects beyond the mouth of the tube, which holds the torpedo in guides against the lateral thrust of the water until the whole of the torpedo is clear of the tube.

Aeroplane Carriage.—When carried on, and

discharged from, an aeroplane, the torpedo is slung horizontally by catches capable of simultaneous release. Before discharge the aeroplane flies about 10 feet above the surface of the water and as horizontally as possible. On release the torpedo enters the water with the speed of the aeroplane at the moment of release. Suitable arrangement is made for moving the actuating lever, mentioned above, at the moment of release. Torpedo-attack by aeroplane was employed in the war of 1914–18, and a few ships were sunk or disabled thereby.

The Director.—In order to aim the tube prior to discharge, this instrument is provided, on which the estimated speed and course of the enemy-ship, its immediate bearing, and the speed of the torpedo can be plotted. The combination will give a resultant course on which the torpedo must travel if it is to strike the enemy-ship. It is in the estimation of the speed and course of the enemy-ship that much skill is required if success in hitting is to be attained, and the chances of error in estimation are the limiting factors in the practical employment of the torpedo.

Torpedoes have proved their value in war, sparingly at first, as would be expected, owing to their lack of speed and uncertain steering; but in the war of 1914–18, when perfected and reinforced by the concealed attack of the submarine, their effects may justly be described as tremendous. The loss by Great Britain, attributed to the torpedo, was some six million tons of mercantile shipping and some sixty war vessels of all sizes, including six battleships.

For torpedo-boats, torpedo-catchers, and torpedo-nets, see NAVY; see also SUBMARINE NAVIGATION.

Torquay, a watering-place and municipal borough (1892) of South Devon, occupying a cove on the north side of Tor Bay, 23 miles S. of Exeter and 220 WSW. of London. Torre Abbey was founded here for Premonstratensian monks in 1196; and Tor Bay is famous in history for the landing of William of Orange at Brixham (q.v.) in 1688, and during the war with France was often used as a naval rendezvous. But till the beginning of the 19th century Torquay itself was little more than an assemblage of fishermen's huts. Then the advantages of its climate—a peculiarly sheltered position, an equable temperature (mean 44° F. in winter, 55° in summer), and freedom from fogs—caused it to be resorted to by invalids, and it soon acquired a European celebrity, which still is almost unrivalled. The romantic hills and valleys of Torquay and its environs have been overspread with terraces, villas, and gardens, the luxuriance of its foliage being a delightful feature of this 'gem of the English Riviera,' which attracts about a quarter of a million visitors each year. The scenery is as varied as it is beautiful, the geology of the district most interesting; and Kent's Cavern (q.v.) is only a mile distant. The remains of the abbey include some crypts and the 13th century 'Spanish barn' (so called from its having housed some survivors from the Armada); and St Michael's Chapel, on a hill-top, is thought to have been connected with the abbey. St John's Church, by Street, is a striking Early English edifice; and other buildings are the old town-hall (1858), museum (1875), theatre (1880), Princess pier and concert hall (1910), pavilion (1912), new town-hall (1913), and medical and swimming baths (1916). The corporation medical baths comprise one of the best and most modern establishments of the kind in Europe. Torquay is a great yachting station; its chief industries are the working up of Devonshire marbles and the manufacture of pottery ware. Pop. (1851) 7903; (1881) 24,767; (1911) 38,771; (1921) 39,432.

Torque. See TORSION.

Torque (Lat. *torqueo*, 'I twist'), a species of gold ornament, worn round the neck or arm, which was much in use in ancient times, both among Asiatic and north European nations. It consisted of a spirally-twisted bar of gold, bent

Torque.

round nearly into a circle, with the ends free, and terminating in hooks, or sometimes in serpents. These ornaments seem to have formed an important part of the wealth of those who wore them, and of the plunder obtained by the Roman conquerors from a Celtic or oriental army. Numerous examples have been dug up in Great Britain and Ireland, as well as in France.

Torquemada, TOMÁS DE, the first inquisitor-general of Spain, was born at Valladolid in 1420, and died at Avila, 16th September 1498. He became prior of a Dominican monastery at Segovia, and succeeded in persuading Ferdinand and Isabella to crave from the pope the appointment of the 'Holy Office' of the Inquisition (q.v.). Torquemada was appointed its head, and began in 1483 that infamous work which has left his name a byword for pitiless cruelty. He has given a subject to Longfellow and to Hugo. See Life by Rafael Sabatini (1913).

Torre Annunziata, a thriving town of Southern Italy, stands at the south base of Mount Vesuvius, 13 miles SE. of Naples by rail. A fishery and a coasting trade are carried on; there are iron-works, macaroni is made, and silkworms are bred. Pop. (1921) 35,270.

Torre del Greco, a town at the base of Vesuvius, is only 7 miles from Naples by rail, and has been repeatedly destroyed by eruptions. Fishing is a great source of occupation, and coral is worked. The festival of the four altars (Festa dei Quattro Altari) in June commemorates the abolition of feudalism in 1700. Pop. (1921) 45,641.

Torrens, LAKE, sometimes a brackish lake, at others merely a vast salt-marsh, in South Australia, 90 miles N. of Spencer's Gulf; usual length, 120 miles by 40. It is named after Sir R. R. Torrens (1814–84), who between 1841 and 1853 held important offices in the colony, and is remembered for his Land Titles Registration Act. In 1869–74 he sat in the imperial parliament for Cambridge.

Torre Pellice (Fr. *La Tour*), a Piedmontese town of 5000 inhabitants, 34 miles SW. of Turin by rail. It is the headquarters of the Waldenses (q.v.), with a fine church, a hospital, an orphanage, and a college, and some manufactures of cotton-cloth and silk.

Torres Strait lies between the northernmost part of Australia and New Guinea. The channel is 80 miles in width; and its navigation, though practicable, is rendered dangerous and difficult by innumerable shoals, reefs, and islands. It was discovered in 1606 by Luis Vaez de Torres, a Spanish navigator sent out by the viceroy of Peru, but the record of his discovery was not published till 1764. See map at NEW GUINEA, and the *Reports* (1901 *et seq.*) of the Cambridge Anthropological Expedition.

Torres-Vedras, a town of the Portuguese province of Estremadura, 26 miles N. of Lisbon by rail. It is known from those famous lines of defence within which Wellington defended himself the winter of 1810–11 against Masséna. There were three such lines of fortification; and the area within the lines was about 500 sq. m. Hence Wellington issued on that career of slow and hard-won victory which ended in the expulsion of the French from the Peninsula. Pop. 6000.

Torreya, See YEW.

Torricelli, EVANGELISTA, mathematician and philosopher, was born at Piancaldoli in the Romagna, 15th October 1608. He was brought up by an uncle who resided at Faenza, and who put him under the tuition of the Jesuits. When twenty years old he was sent to Rome, and there devoted himself to mathematical studies. Galileo's theories on force and motion engaged his attention, and led to his writing a *Trattato del Moto* (about 1641), and to his being invited by Galileo (1641) to visit him; on the old philosopher's death, three months afterwards, he was appointed mathematician to the grand-duke, and professor to the Florentine Academy. Here he resided till his death, 25th October 1647. His great discovery was the interpretation of the previously known fact that water will rise in a suction-pump only to the height of about 32 feet—the idea that the column of fluid is sustained by the pressure of the atmosphere on the open surface of fluid (see BAROMETER). The vacuum in the barometer is the Torricellian vacuum; and the barometer is sometimes called the Torricellian tube. Torricelli also effected the quadrature of the cycloid, and made other mathematical discoveries. To him we owe the fundamental principles of Hydromechanics (q.v.); and he made and greatly improved both telescopes and microscopes. His *Opere* were edited by Loria and Vassura (Faenza, 1919).

Torridonian, a series of red and brown pre-Cambrian sandstones, &c., in horizontal beds, which form pyramidal hills in the north-west Highlands of Scotland, from Cape Wrath to Rum, notably around Loch Torridon.

Torrigiano, PIETRO (1470–1522), the Florentine sculptor who, according to Cellini, broke Michelangelo's nose in a quarrel, served as a mercenary soldier, and came to England in 1509 to erect the tomb of Henry VII. and his queen, still in Westminster. He executed other works which were destroyed at the Reformation, and settling in Spain, died in the prisons of the Inquisition.

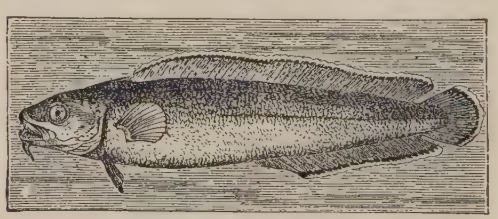
Torrington, GREAT, a borough (1554) of North Devon, on an eminence sloping to the Torridge, 10 miles SSW. of Barnstaple. A castle (1340) has disappeared, though its bowling-green is still in use. The church, accidentally blown up with 200 prisoners, after Hopton's defeat by Fairfax, 16th February 1646, was rebuilt in 1651; Wolsey and John Howe were incumbents. Torrington gave the title of earl to Monk (q.v.) and in 1689 to Admiral Arthur Herbert (1647–1716), of viscount to Admiral George Byng (q.v.). Gloves are manufactured, and the place is noted for its foxhounds, otterhounds, and salmon-fishing. Pop. 3000.

Torsion is the kind of strain produced in a bar or wire when one end is kept fixed and the other is rotated about the axis. The axis itself is in no way changed, but every other line originally parallel thereto takes the form of a helix or screw. The torsion is measured by the inclination of the diameter of any section to the diameter originally parallel to it of the section at unit distance. The moment of the forces which produce the torsion is called the torsional stress or *torque;* and the coefficient of torsion is the ratio of the stress to the strain. The coefficient of torsion depends on the Rigidity (q.v.) of the material and upon the size and form of the bar. For wires and bars of circular section the coefficient of torsion varies as the fourth power of the radius. That is, to produce the same torsion in two wires whose diameters are as 2 to 1, we must apply, in the case of the thicker wire, a torsional stress 16 times greater than that needed for the thinner wire. By the manufacture of excessively thin quartz fibres Professor Boys obtained torsional coefficients of very minute magnitude.

Torsion-balance is a form of apparatus in which the torsion of a wire is used for the measurement of various kinds of forces. In this way Coulomb discovered the fundamental laws of electric and magnetic attraction (see ELECTRICITY) and Cavendish measured the density of the Earth (q.v.). By means of his quartz fibres Professor Boys was able to reduce into a very small compass the whole apparatus for making the Cavendish experiment.

Torsion, in Surgery, is a method of common application for the purpose of checking arterial hæmorrhage in certain cases. The wounded vessel is drawn out and fixed by a pair of forceps a quarter of an inch from the end; the end of the artery is then twisted round till it will not untwist itself. It is especially useful when there are many small arteries wounded in an operation, as, for example, in the extirpation of a large tumour.

Torsk, or, by corruption, TUSK or CUSK (*Brosmius brosme*), a valuable fish of the cod family (Gadidæ), abundant in the northern parts of the Atlantic. It measures from 18 inches to 3 feet in length. The head is small, with one barbule under the chin; the single dorsal fin is long; the tail is rounded. The head is dusky, the back and sides yellow, passing into white on the belly. The torsk



Torsk (*Brosmius brosme*).

lives in deep water, but spawns very early in the year among the seaweed of rocky coasts. It is caught in the same manner as cod, ling, &c. Firm and tough when fresh, it is esteemed when dried and salted. It is occasionally caught in the Firth of Forth, but belongs to more northern regions, and is very abundant off the Shetland Isles, the Faeroes, on some parts of the coast of Norway, and on the south and west coasts of Iceland. Another species (*B. flavescens*), with two barbules, occurs on the Newfoundland banks.

Torso (Ital.), strictly, signifies a trunk—e.g. the trunk of a tree—but is specially applied to a statue of which only the body remains.

Torstensson, LENNARD, Count of Ortala, a Swedish general, was born at Torstena on 17th August 1603. He accompanied Gustavus Adolphus to Germany in 1630, distinguished himself in the battles of his great master, and after his death fought under Bernhard of Saxe-Weimar and Banér, and in 1641 he was appointed to the supreme command of the Swedish army in Germany. He invaded Silesia, and, when driven back by the imperialists, turned and crushingly defeated them at Breitenfeld (2d November 1641). The next winter

he hastened north, and in six weeks swept the Danes out of Holstein, and then drove the Austrians, who had thought to assail him in the rear, ignominiously back all the way to Bohemia. In 1645 he advanced to the walls of Vienna. He died at Stockholm on 7th April 1651.

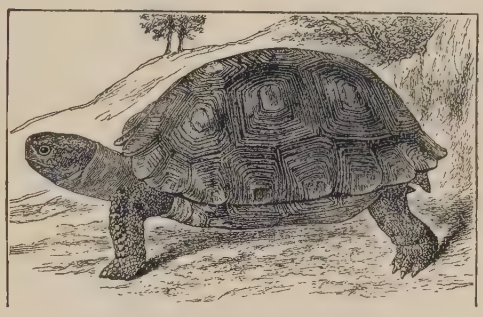
Tort (Lat. *tortus*), in the law of England, includes all those wrongs, not arising out of contract, for which a remedy by compensation or damages is given in a court of law. Such are assault, false imprisonment (i.e. arrest or detention without legal justification), unlawful detention or conversion to one's own use of the goods of another, &c. Deceit also is a tort, if a person suffer damage by acting on an untrue statement made with the intention that he should act on it. The general rule of law was that the right of action for a tort died with the person who committed it; but this defect has been cured by statute to a certain extent. If the wrong was done within six months preceding the wrong-doer's death, an action may be brought against his executors within six months after they have assumed office. So if the injured party lived he could always bring an action of damages; but if he died his executors or relatives could not do so until Lord Campbell's Act enabled the wife, husband, parent, or child of such deceased injured party to sue for damages; and in such case the jury may apportion the damages between the widow and children who sue. The right to bring an action for a tort is limited to two, four, or six years respectively, according to the nature of the wrong. In Scotland there is no time limited for bringing the action. The law of the United States is founded on that of England.

See treatises by Addison (1857; 8th ed. 1906), Clerk and Lindsell (7th ed. 1921), Salmond (5th ed. 1920).

Tortoise-plant, a South African name for Elephant's Foot (see HOTTENTOT'S BREAD).

Tortoises and **Turtles** (*Chelonia*) form a well-defined class or sub-class of Reptiles, distinguished especially by the investing shields. Although terrestrial forms are often called tortoises and aquatic forms turtles, the distinction cannot be sustained. The dorsal shield or carapace, within shelter of which the head, limbs, and tail can be more or less retracted, has a complex composition. Externally it is typically covered with epidermic horny scales. The bony part beneath these is made up of (*a*) the flattened neural spines of the dorsal vertebræ, plus overlying dermal scutes, (*b*) the flattened and more or less coalescent ribs, plus overlying dermal scutes, and (*c*) marginal scutes round the periphery. The ventral shield or plastron is typically covered with epidermic scales, and consists of a number of subcutaneous ossifications which probably correspond in part to the 'abdominal ribs' of crocodiles and some other reptiles, and in part to clavicles and interclavicle. The marginal plates link the carapace and the plastron together. There is no breastbone; the limbs are very typical except when turned into paddles; in the course of development the girdles are overarched by the ribs. In the skull the bones are immovably united; there are no teeth, though hints have been detected in some embryos. The brain of the adult Chelonian shows a slight curvature, and, as in all higher vertebrates except snakes, there are twelve cranial nerves, two more than occur in amphibians and fishes. The heart, as in other reptiles except crocodiles, is anatomically three-chambered, but the presence of an incomplete partition in the ventricle makes it work almost as if it had four chambers. The food-canal, ureters, and genital ducts open into a common cloaca, to the wall of which in the males a penis is attached. The large lungs are fixed along the dorsal wall of the thorax. As the body is boxed in by shields which are often quite rigid, the contraction and expansion of the lungs in respiration must be due partly to their own elasticity, partly to the movements of the viscera with which they are closely connected, and partly to the changes which result when the animal retracts or extends its head and limbs. At the best the respiration is sluggish; and, as this will affect the whole pitch of the animal's life, the sluggishness may be regarded as the price paid for the very strong armature.

Tortoises excel most animals in their tenacity of life. They can live for a long time without food; they are very difficult to kill, and even after the brain has been destroyed life lingers long in the body. It is said that a headless tortoise has been observed to walk 200 yards twenty-four hours after decapitation; and it is well known that the heart removed from the body will, if carefully suspended in a moist chamber, continue capable of beating for two or three days. All Chelonians are oviparous. The eggs have a firm shell, which is in most cases rigidly calcareous. They are usually laid in the sand or mud, and left to be hatched by the warmth of the sun.

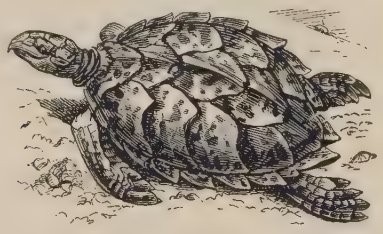


Tortoise (*Testudo elephantopus*).

Chelonians include two orders, the Athecæ and Thecophora. The Athecæ are represented by one living form, the rare, intertropical, pelagic, Leathery Turtle (*Sphargis* or *Dermatochelys coriacea*), with the dorsal vertebræ and their ribs free from the carapace, which consists of small polygonal plates, covered with leathery skin without horny epidermic scales. It may attain a length of 6 feet and a weight of half a ton. The Thecophora have the dorsal vertebræ and ribs implicated in forming the carapace, and there are horny epidermic scales except in Carettochelys and Trionychoidea. There are about a dozen families.

The Chelydridæ include the Snapping Turtle (*Chelydra serpentina*) of North and Central America, which gives a ferocious bite, and the vicious Alligator Turtle (*Macroclemmys temmincki*) of the Mississippi and Missouri basins. Of the Cinosternidæ, the Mud Turtle or Stinkpot Terrapin (*Cinosternum odoratum*) is a notorious type on account of the disagreeable smell of its groin glands. The Testudinidæ include forms like the Common Greek Tortoise (*Testudo græca*) and various giant species—e.g. *T. gigantea* of the Seychelles and *T. elephantopus* of the Galápagos Islands, the American Terrapins (*Chrysemys*), the European Pond-Tortoise (*Emys orbicularis*), the edible Terrapin (*Malacoclemmys terrapin*), much eaten in the eastern United States. The Chelonidæ are turtles in the stricter sense—e.g. the Green or Edible Turtle (*Chelone mydas*), which is often 3 feet long, a vegetarian species feeding chiefly on seagrass and dulse; the Hawk's-bill Turtle (*Chelone imbricata*), furnishing the 'tortoise-shell' of com-

merce; and the Loggerhead Turtle (*Thalassochelys caretta*), a carnivorous species of little commercial value. The Pelomedusidæ are well represented by *Podocnemis expansa*, very common in tropical South America; the Chelydidæ by the Matamata (*Chelys fimbriata*), one of the quaintest of Chelonia, from the rivers of Guiana and north Brazil; the soft-skinned, fresh-water Trionychoidea by *Trionyx ferox*, the commonest soft-shelled turtle of the United States, a voracious carnivorous creature. Apart from the Trionychoidea, the other Thecophora are often divided into two groups, distinguished by the manner in which the head is retracted. In one set—the Cryptodirans, or hidden-necked Chelonians—'the head is drawn directly within the margin of the shell by the bending of the neck in an S-like manner in a vertical plane.' In the other—the Pleurodirans, or side-necked Chelonians—'the neck is bent sideways, so that the head, when retracted, lies on one side of the front aperture of the shell near one of the legs.'



Hawk's-bill Turtle (*Chelone imbricata*).

The tortoises often kept as garden pets in Britain are *Testudo ibera* from Morocco and Asia Minor, *T. græca* from the northern half of the Balkan Peninsula, Asia Minor, and Mediterranean islands, and occasionally *T. marginata*, which is the only land tortoise in Greece. They are vegetarian, liking lettuce, cabbage, dandelions, and clover; they will learn to take bread soaked in milk or water. They are fond of sunshine, and go to sleep early; they bury themselves in winter in a heap of mould or the like; they pair in early summer, and two to four white hard-shelled eggs are buried in the earth. Gilbert White's *T. ibera* lived for over fifty years in Britain, though this is on an average too cold a country for their comfort. Tortoises are rather irresponsive pets, but they have some memory for persons and a strong sense of locality.

TORTOISE-SHELL, the large scales of the carapace or shield of a species of sea-turtle, the *Chelone imbricata* (see above), is so called because formerly the order of animals to which it belongs was little known, and all were confounded under the general name of Tortoises. A remarkable peculiarity in this species is the arrangement of the thirteen plates forming the carapace, which, instead of being joined together by their edges so as to make apparently one piece, are thinned off at their edges, and overlap each other like the tiles of a roof. They vary in size according to the part of the shield they occupy. The larger are sometimes from a foot to 18 inches long by 6 inches broad; the thickness rarely exceeds the eighth of an inch. The beautiful mottled colour and semi-transparent characters of this material are well known. A remarkable quality is possessed by tortoise-shell which very greatly increases its usefulness for the ornamental purposes to which it is generally applied—i.e. the property of being easily softened by a heat equal to that of boiling water, and of retaining any form when cold which has been given to it when heated. Pieces can also be welded together by the pressure of hot irons properly applied. In Britain the chief use of tortoise-shell is making combs for the hair; but it is also used for inlaying ornamental furniture and various other fancy objects. By the French cabinet-maker Boule (see BUHL) it was used most effectively in combination with brass as a veneer for rich furniture, and all boule or 'buhl' work consists of such a veneering combination. In India, China, and Japan many articles are made of it, showing great skill and taste.

Tortola. See VIRGIN ISLANDS.

Tortona, a town of Northern Italy, on the Scrivia, a small tributary of the Po, by rail 13 miles E. of Alessandria. The ancient Dertona was a Ligurian town, whose position made it important; it was also a strong fortress in the Middle Ages. Pop. of commune (1921) 20,026.

Tortosa, an old town of Spain, 42 miles SW. of Tarragona, on an eminence overlooking the Ebro, 20 miles from its mouth, with trade in olives, locust beans, and fruits, and some manufactures; pop. (1920) 33,044.

Tortugas (Sp., 'turtles'), DRY, a group of ten islets or keys belonging to Florida, at the entrance of the Gulf of Mexico, 120 miles WSW. of Cape Sable. They are very low, and partly covered with mangrove-bushes; on Garden Key there is a light-house, and also a fort.

Torture has been largely used in many countries as a judicial instrument for extracting evidence from unwilling witnesses, or confessions from accused persons, and in the despotisms of the East is still so used; the callousness of torturers and tortured being almost equally remarkable. In ancient Athens slaves were regularly examined by torture. Under the Roman Republic only slaves could be tortured; under the Empire torture, besides being much used in examining slaves, was occasionally inflicted even on freemen, to extract evidence of the crime of *læsa majestas*. Cicero and other enlightened Romans wholly condemned its use. Until the 13th century torture seems to have been unknown to the canon law; about that period the Roman treason-law began to be adapted to heresy, the notions on which the Ordeal (q.v.) was based contributing to promote its use. At a later period torture came to be largely employed by the Inquisition, and it was only in 1816 that it was prohibited by a papal bull. Its use was universal in the witchcraft trials, and accounts for the strange uniformity in confessions.

From the civil law torture became a part of the legal system of most European countries. It was adopted early, and to a large extent, by the Italian municipalities. In Germany elaborate apparatus for its infliction existed, not merely in the dungeons of the feudal castles, but in the vaults beneath the town-halls of Nuremberg and Ratisbon. Horrible tortures were constantly inflicted in the 16th and 17th centuries; the 'second degree' included crushing the thumbs, feet, or head in iron apparatus, and the 'third degree' burning the sides, arms, and finger-nails with fire or red-hot irons and pincers. Torture continued to be practised in many of the prisons of Germany when they were visited by Howard in 1770; but in Prussia it was abolished in 1740–54, and the example of Frederick the Great contributed greatly to its final suppression. In Hanover it was not formally abolished till 1840. The torturing of prisoners was carried to a great height in the Low Countries under Philip II. Savonarola and Galileo are amongst famous men who suffered torture. In France it was part of the judicial system till 1789, and in Scotland it was still in frequent use after the Restoration, and was only abolished in 1708. Torture in its most pitiless form was a characteristic feature of the atrocious Templar trials in

France. Amongst enlightened men who denounced the worthlessness of confessions secured by torture Bayle, Thomasius, Voltaire, and Beccaria deserve mention. In Naples torture was in use in 1860.

The use of torture seems always to have been repugnant to the genius of the law of England: though occasionally used by an exercise of prerogative, it may be doubted whether it was ever recognised as lawful in the ordinary course of the administration of justice. It was employed by royal warrant in the Templar trials (1310), and we are told that till that time it was unknown in England. During the Tudor period the Council assumed the power of directing torture-warrants to the lieutenant of the Tower, and other officers, against state prisoners, and occasionally also against persons accused of serious crimes; and similar warrants were at times issued under the sign-manual. Under James I. and Charles I. torture was less resorted to, and only in state trials. In 1628, in the case of Felton, the assassin of the Duke of Buckingham, the judges declared the examination of the accused by torture, for the purpose of discovering his accomplices, to be illegal. Torture was inflicted in England in 1592, in the case of the Jesuit Southwell (q.v.), in 1640 on Archer, who took part in an attack on Laud's palace, and as late as 1646 on witches. In 1806 Sir Thomas Picton (q.v.) was tried for having, as governor of Trinidad, permitted a woman to be tortured under old Spanish laws. Torture is now disused in all countries of Europe, and is universally acknowledged to have been a most unsatisfactory mode of getting at the truth, often leading the innocent, from weakness, to plead guilty.

The instruments of judicial torture have been various. The most celebrated are the Rack, the Boot, and the Thumbscrew. More ingenious instruments were such as the Scavenger's Daughter (rather 'Skeffington's Daughter,' from a lieutenant of the Tower under Henry VIII.), a spiked iron frame, which closed its victim in a deadly embrace. The *Peine Forte et Dure* (q.v.) was a terrible form of torture.

From torture for the sake of extracting evidence must be distinguished cruel punishments and modes of putting to death by lingering tortures —mutilation, breaking on the wheel, burning at the stake, disembowelling, &c. (see EXECUTION). Notable instances of such were the tortures inflicted on the murderers of James I. of Scotland in 1437; on Damiens (q.v.), the would-be assassin of Louis XV. in 1757; and on Jean Calas (q.v.) in 1762. See also FLOGGING, PILLORY, STOCKS. Army discipline has sometimes been upheld by 'field punishments' of great severity. Prison discipline was formerly little short of torture, including the use of bilboes and other dreadfully heavy irons; as also was the management of the insane; and the school punishments of comparatively recent times would now be regarded by many as falling under the same head. Powell's *American Siberia* (1892) describes a state of things in the convict-camps of the United States down till 1875 which may fairly be regarded as amounting to cruel torture—including the stringing of convicts up by their thumbs. The marvellous collection of instruments of torture (including the 'Iron Maiden,' resembling the 'scavenger's daughter') once used with hideous effect, and long on show as curiosities in Nuremberg, was bought by Lord Shrewsbury, and exhibited in London in 1891.

See INQUISITION, and works cited; WITCHCRAFT; BOOT, RACK, THUMBSCREW; Jardine, *Torture in the Criminal Law of England* (1837); Lecky, *Rationalism in Europe* (1865); Lea, *Superstition and Force* (Phila. 1866; new ed. 1878).

Toru Dutt, a young Christian Hindu girl of extraordinarily precocious genius, was born in Calcutta, 4th March 1856, studied French and English literature with avidity, spent the years 1869–73 in England and France, and at eighteen published a critical essay of strange maturity on Leconte de Lisle, with translations into English verse. She next gave herself to Sanskrit, and translated several portions of the *Vishnupurâna* into English blank verse. In 1876 she published *A Sheaf gleaned in French Fields* (2d ed. Lond., with Memoir by her father, 1880), being English translations of about two hundred French poems. Next year she died, 30th August 1877. A romance which she had written in French, *Le Journal de Mdlle. d'Arvers*, was published at Paris in 1879, with a study by Mdlle. Clarisse Bader. Finally her *Ancient Ballads and Legends of Hindustan* was published at London in 1882, with a Memoir by E. W. Gosse.

Torula. See SACCHAROMYCETES.

Toruń, the Polish name of Thorn (q.v.).

Tory (Irish *toraidhe*, 'a pursuer'), a name first given to certain bands of outlaws, half robber, half insurgent, who professed the Roman Catholic faith, and harassed the English in Ireland. It is used in this sense in Gayton's *Pleasant Notes upon Don Quixot* (1654), the Irish State Papers (1656), and R. Burney's *Kerdiston Dōron* (1660)—'Wilful peasants . . . degenerate into *torees* and moss-troopers.' About 1679, the time of the Popish Plot, it began to be applied as a term of reproach to the Cavalier or Court party, as supposed abettors of that trumped-up conspiracy. Oliver Heywood's *Diaries* (ed. by J. H. Turner, 1881) refer, under the date 24th October 1681, to 'the Ranters calling themselves Torys . . . an Irish title for outlawed persons,' which shows that the nickname was soon adopted by one of the two great political parties in Great Britain—the adherents, namely, of the ancient constitution of England without change, supporters of regal, ecclesiastical, and aristocratic authority; 'their prejudice,' said Dr Johnson, 'is for Establishment, while that of the Whigs is for Innovation.' As Whig (q.v.) has been largely superseded by Liberal, so, since 1830, has Tory been by Conservative (q.v.), and since 1886 by Unionist. In America the loyalists were called Tories during the Revolutionary war.

See books by Kebbel (1885) and O'Grady (1886), and F. E. Smith's (Lord Birkenhead's) *Toryism illustrated by Extracts from Representative Speeches and Writings* (1904).

Tory Island, 2½ miles long, 9 miles off the coast of Donegal, has a lighthouse and signal station.

Torzhok, an ancient town of Russia, 310 miles SE. of St Petersburg by rail; pop. 15,000.

Tosks, the inhabitants of southern Albania (q.v.).

Tostig, a son of Earl Godwin (q.v.), was in 1055 made earl of Northumbria, which he ruled with severity. In 1065 the Northumbrians deposed him, choosing Morcar as earl. King Edward acquiesced. Tostig retired to Flanders, Normandy, and Scotland, and after raiding the Isle of Wight and the south-east coast, joined in Harold Hardrada's invasion, and was killed at Stamford Bridge (1066). See HAROLD II. (England), HAROLD III. (Norway).

Totanus. See SANDPIPER.

Totemism (from Algonquin, *ototeman*; from a stem, *ote*, which signifies brother-sister kin) is a very wide-spread institution among savage and barbaric peoples. The word as 'totam' is thought to have been first printed by J. Long, an Indian interpreter, in his book of travels (1791), but references to the institution occur in *The Royal*

Chronicles of the Yncas, by Garcilaso de la Vega—an Inca on the maternal side—and elsewhere. The most apparent feature of totemism is 'an intimate relation supposed to exist between a group of kindred people on the one side and a species of natural or artificial objects on the other, which objects are called the totems of the human group' (J. G. Frazer, *Totemism and Exogamy*, vol. iv. pp. 3-4, 1910). Though there are cases (as in the 'Arunta nation' of Central Australia) in which sets of human beings connected with the same totem are *not* 'kindred groups,' these cases are exceptions, and can be shown to have diverged from the ordinary type. (This, however, is not the view of Frazer.) There are also numerous instances in which individuals have, or may acquire, a supposed relationship with any object which is not, or very rarely is, hereditary. In some Australian tribes each sex has an animal patron, commonly called 'sex-totem;' and in some cases the kindred groups of people each claim connection with or possession of a smaller or larger number of objects, called 'sub-totems.' Again, mainly in Africa and Polynesia, some *local tribes* (not kindred groups) are attached to an object, usually an animal, called in South Africa the *Siboko*.

We are, however, concerned with the relation between each kindred group and its totem, which is usually, but not always, forbidden to be killed or eaten by the members of the kindreds connected with it and bearing its name, such as bear, duck, cat, or what not. Next, it is the all but invariable rule that such members of such kindred groups of totemic name may not intermarry. Cat may not marry cat, or crow, crow, whether the totem-name be inherited from the father or the mother.

Totemic Exogamy.—This custom is called 'totemic exogamy,' or marrying out of the totem. The rule, except where it has conspicuously broken down in the course of evolution, is universal; though it is not found in the aforesaid Arunta nation, where totems are not hereditary, and totem-sets are not akin. Where some persons have acquired animal familiars or protectors, either before birth (the Banks' Islanders, the Arunta) or later, they may marry persons of the same animal, vegetable, or other such name. There are peoples who practise exogamy—i.e. marriage out of a large division of the tribe, or out of a given district—who are not now totemists; and, as in the case of the Arunta, there are totemists whose exogamy is not now governed by the totem, but by the arrangement, mainly found in Australia alone, of 'matrimonial classes,' two, four, or eight subdivisions of each tribe.

The Study of Totemism.—The importance of totemism and of exogamy was first perceived by John Ferguson M'Lennan (see his *Primitive Marriage*, 1860, and *Worship of Plants and Animals*, 1869, 1870, republished in his *Studies in Ancient History*, 1896). Thereon followed a good deal of speculation on the origins of totemism and exogamy, by Herbert Spencer (the totems were animal-names or nicknames of human ancestors; the respect felt for them was transferred to the animal species), Lord Avebury (before fathers were recognised the same process occurred in the name of a leader of the human group), Wilken (the animal into which an ancestor's soul transmigrated was that honoured). The totem is the familiar or guardian spirit of an ancestor become hereditary (Dr Boas, C. Hill Tout). All these theories meet the difficulty, at once pointed out by M'Lennan, that the totem name often, and probably at first always, has descended through women. Moreover, as animal-names of individuals are extremely common, it is not apparent why the name of a single person should thus have been selected and crystallised into a patronymic. (For criticism of these theories, see J. G. Frazer, *Totemism and Exogamy*, pp. 43-50, with the references.) Dr Haddon, looking for the origin of a group-name, suggested that each group might be called by its neighbours after its staple article of food. But ravens, wolves, wallabies, and lions, and so on, can never have been the staple articles of the food of any group. Still, we have here the idea that animal-nicknames were imposed upon groups from without, and were accepted, till each such group came to respect its name-giving animal or plant (Haddon, Report of British Association, Belfast, 1902, pp. 8-11).

A form of this theory had been published by myself in a magazine article, and has since been presented in *The Secret of the Totem* (1905), in which objections are answered. The replies are unnoticed by Frazer in his criticism of Dr Haddon (*Totemism and Exogamy*, vol. iv. p. 51), where my theory is entirely ignored. In 1887 J. G. Frazer first made, in his *Totemism*, a collection of all the evidence then available. This was but a small volume, and the increase of knowledge may be estimated by his four large tomes, *Totemism and Exogamy* (1910), in which his original tract is reprinted. There are additions of information constantly accruing, but Frazer's great work is indispensable to every student of the subject. From his speculative views the present writer differs in most essential points. His map of the totemic world shows that he finds totemism universal in Australia (the most backward region); covering a large area of North America from sea to sea; rare in Central and South America; and represented in ten regions of Africa—East, Central, and South; and in India, Sumatra, Melanesia, Fiji, and New Guinea, with probable traces elsewhere. The traces in Greece—Minoan and Hellenic—among the Celts, ancient Israel, and ancient Egypt are disputable, and are not discussed by Frazer.

The Origin of Totemism.—Readers anxious to arrive at results ask, what is the origin of totemism? There have been many theories, as we have seen, and students, as new knowledge accrues, naturally desert old for fresh hypotheses. The same remark applies to the origin of laws restricting marriage—'Exogamy.' In Frazer's present view, exogamy and totemism were originally independent, which is also the view of the present writer. As to totemism, Frazer rests mainly on the customs and beliefs of the natives of central and northern Australia, especially of the Arunta, and on those of the Banks' Islanders (Spencer and Gillen, *Native Tribes of Central Australia*, 1899; *Northern Tribes*, 1904; Dr Rivers, 'Totemism in Polynesia and Melanesia,' *Journal of Anthropological Institute*, xxxix. 1909, pp. 156-180). In these parts of Australia he finds nescience of the part of the male in procreation, while the child is regarded as the incarnation of a primal totemic spirit or germ. In the Arunta nation such spirits, in each case all of one totem, haunt definite spots, and each child's totem is that of the spirits of the place where the mother first became aware of its vitality. In the other northern and central tribes the child is a spirit either of its father's or mother's totem, and is hereditary and exogamous. Among the Arunta it is neither hereditary nor exogamous. Persons of the same totem, among the Arunta, have common magical rites, but are not a kindred group, and they sometimes, but rarely, intermarry. The Banksian islanders are a much more advanced people than any Australians, and are perfectly aware that conception is the result of the unions of the sexes. But if a woman finds in her loincloth an animal or vegetable, *that* has the closest

rapport with her child, who, in some way, is affected by the *spiritual* animal or vegetable. There are no kindred totem groups in this case, and a man and woman with the same animal or plant connection may intermarry as much as if they had acquired the connection with their familiars in later life.

Reasoning from these facts, Sir James Frazer thinks that the origin of totemism was 'conceptional.' Pregnant women first discovered their condition when they first felt the life of their burden, and argued that any object which impressed their fancy at the moment—bird, beast, fruit, flower, water, or what not—had then in some way entered into them. The child was that thing, and that thing was its totem (*Totemism and Exogamy*, vol. iv. pp. 57–71).

Thus totemism is a primitive theory of conception, and the intimate *rapport* of man and his totem is explained. Totems became hereditary, on the theory, when the male cohabitant of the woman, or, more frequently, the woman herself, desired that the children should be of his or of her totem—a desire never felt by the Arunta nation or by the Banks' Islanders! The objections to this theory are many. We give two. (1) That woman is nowhere found determining by her 'sick fancies' the totem of her child. Among the Arunta the totem is determined by a regular rule, part of the amazing spiritual or animistic philosophy of the people. That philosophy explains how man comes to have a spirit, a soul which, at the beginning, tenanted an animated bulk, later differentiated into this or that plant or animal, and which is constantly reincarnated. The same explanation also accounts for the fact that man is totemistic. Each person has the spirit of the animal or other totem object which was in the beginning. This theory—too ingenious and complex to be primitive—has, by its neat psychology, superseded the physiological theory of conception familiar to Australian tribes of the lowest and least complex social organisation (that of the Arunta is the most complex). (2) The Arunta have certainly passed, in no very remote age, out of normal, hereditary, exogamous totemism. This is clear, for only a small minority of each totem occurs in one main exogamous division; the majority is in the other; so that, unlike all other peoples with such divisions, a man *may* find a woman of his totem out of his exogamous division, and so may marry her. This is made possible (Spencer and Gillen, *Native Tribes of Central Australia*, p. 123) by the Arunta method of obtaining totems. The totem has got out of its original and 'right' into another, the 'wrong,' division. The natives recognise the 'wrongness' of this, which entails civil liabilities on the owner of the totem. Had the Arunta originally obtained totems in their present accidental way, the process would necessarily have distributed the totems almost equally between both main exogamous divisions. But this is not the case. 'The great majority' of each totem-set is in one or in the other of the main divisions; is still in the 'right' division. The present Arunta system is therefore a late result of the animistic philosophy. The Arunta recognise the right and wrong in the matter. The 'right' is the original division. These facts are not commented on by Sir J. G. Frazer. In the opinion of the present writer they indicate that, not so long ago, the Arunta totems, like those of all other Australian tribes, were so arranged that each totem-kin was confined to one or other main exogamous division. The Arunta philosophy of spirits and reincarnations has caused the change, which is still obviously incomplete.

The Origin of Exogamy.—We have spoken of 'exogamous divisions.' Those in Australia present three degrees of complexity (see note III.). In the first, the tribe is divided into two main exogamous intermarrying divisions or phratries, such as *Mukwara* (Eagle-hawk) and *Kilpara* (Crow). In each is a number, greater or less, of totem-kins. As all must marry out of their phratries, none can marry into his or her totem. No one is of that totem in the phratry not his own. In the next case the divisions are four; in the third they are eight (as among the Arunta). The first rule prevents marriages of brothers and sisters, and of mother with son or father with daughter—as the descent is reckoned in the female or male line. The two others exclude relations not so close. But not only persons of actual blood-kin but 'classificatory' kin—that is, persons of the same grade and status as the actual kinsfolk in each case—are excluded from intermarriage.

In Sir J. G. Frazer's opinion and in that of Messrs Spencer and Gillen, these divisions were devised first when, in an age destitute of restrictions on unions, an objection (for some reason which is matter of conjecture) arose to unions of brother and sister and of mother and son. The first or phratry division excluded these from marriage; but why did it also exclude numbers of people who were not thus akin by blood, but were merely 'classificatory' kin in status? Sir J. G. Frazer gives various apparently incompatible solutions of this problem. One is (*Totemism and Exogamy*, vol. i. p. 288) that the original reformers did not recognise consanguinity: 'they recognised the classificatory system of relationship, and the classificatory system only. . . .' Yet we are also told that they only meant to bar the unions of the nearest consanguineous relations (Frazer, vol. iv. p. 112), having 'a strong aversion to consanguineous unions, particularly to the cohabitation of brothers with sisters, mothers with sons.' And yet 'they recognised . . . the classificatory system of relationship only' (vol. i. p. 288). This statement ('too absolute') is later thus altered out of existence: 'I assume that the founders of exogamy recognised the simplest social and consanguineous relationships'—man with woman, mother with children, brothers with sisters—'and that they extended these simple relationships into the classificatory relationships by arranging all the men and women of the community into one or other of two exogamous intermarrying classes' (vol. iv. p. 272). The second theory contradicts the first, and leaves us asking, why, if men decided only to bar brothers and sisters and mothers and sons from wedlock, did they create by legislation swarms of non-consanguineous classificatory kinsfolk, and forbid them to intermarry? This question receives no satisfactory answer. A conjecture at a superstition about the generally blighting effect of close consanguine marriages does not account for an objection to marriages of persons not consanguine.

It therefore appears that there may be some other explanation of the cause of the primary division into two phratries, though the later divisions appear to be legislative measures following the same lines, and following them into a fatal *impasse*.

Another Theory of the Origin of Totemism and Exogamy.—The theories which we have been discussing postulate that man originally lived in sexual promiscuity, unions of near kin being prevalent, and license the rule rather than the exception. On the other hand, Darwin held that man was originally solitary, like the gorilla, keeping his women to himself, and expelling—like horses, stags, and other animals—his sons at puberty; or he lived in small communities, but was excessively jealous in keeping his women to himself. In neither case could promiscuity and extreme license occur and require reformation. Starting from Darwin's

view, the late J. J. Atkinson worked out an elaborate system, according to which the jealousy of the sire, prohibiting all intrigues within his fire-circle or camp, and expelling the young males, was the 'primary law,' the beginning of exogamy. The expulsion was mitigated, and sons allowed to remain in the group, on condition of abstaining from the women within it. Such amours and the consequent jealousies and slayings would break up the little community (see Atkinson's *Primitive Law*, published in Lang's *Social Origins*, 1902).

The rule, marriage out of the local group, would persist in Mr Atkinson's system. To this I added that if the local groups were known to each other by animal and other such sobriquets and accepted the names, the rule of exogamy would become, no marriage within the cat, duck, dog, or any group bearing such a name, while the name-giving animals became totems. To the reply that groups would not accept nicknames, I answered by giving many examples of their acceptance of collective nicknames, both in civilised and savage society—derisive nicknames having now actually superseded the old totem-names of Siouan clans in America. I also showed that totemic names of village groups—mice, cuckoos, potato-grubs, herons, and so on—are common in the folklore of modern Europe. Given such exogamous animal-named groups, wives would have to be won in war from alien groups, and if the children of the brides of the spear retained the names of their mothers' groups, the communities would begin to recognise kinship among themselves and desire to obtain wives by peaceful arrangement. Among several very primitive tribes in south-central and south-eastern Australia each totem-kin in phratry A may only marry into one totem-kin in phratry B. This may suggest that originally a pair of totem-kins made alliance and *connubium;* that others followed the example; and that all finally federated, one set of intermarrying kins forming one phratry, and the kins which were their mates forming the other. Finally, as at present (except among the tribes where one-totem-to-one-totem marriage prevails), a man of any totem-kin in phratry A might marry a woman of any totem-kin in phratry B. These processes end in an amalgamation; the divisions—A and B—were not imposed on a tribe previously promiscuous. The non-consanguineous persons excluded by the phratry rule of exogamy from intermarriage did not suffer, as in Sir J. G. Frazer's theory, from a new and needless restriction. They had already been restricted from marrying into their own totem-kins, and though they were excluded from all the women in their own phratry, they had compensation in peacefully obtained wives from all the totem-kins in the phratry not their own. This is the outline of my theory, a modification of that presented in *The Secret of the Totem* (1905). Of course, in all theories the conception of man's primal state—promiscuous or not promiscuous—is matter of conjecture. All turns on the view which we take of that point; but Darwin is a good guide to follow.

On either theory man fell into an initial error. Whether he divided or amalgamated he necessarily cut off many non-consanguineous persons in classificatory relationship from intermarriage. When, in Australia, he came to think that his original aversion had been to closely consanguineous unions and aimed at barring cousins, he divided the tribe, in some cases into four, in others into eight, exogamous classes, always reducing the numbers of the eligible. When the class-names were inherited in the male line, the classes, like Highland clans, came to dwell locally apart. Men had to travel far for the few permitted brides, and among the Kurnai of Gippsland and the Narran-ya of Yorke Peninsula the rules became so irksome that they broke down, and were succeeded by rules of prohibited degree not unlike our own (A. W. Howitt, *Native Tribes of South-eastern Australia;* 1904). Sir J. G. Frazer's valuable book must be consulted for the many varieties of totemism in communities more advanced than those of Australia. In some tribes of north-west America it survives almost on the earliest Australian model; in others, under the influences of wealth, rank, and settled habitation, it is becoming a singularly complex form of heraldry, with blazons and quarterings. In some North American tribes the phratries were dropped, and persons may marry into any totem-kin not their own. In Melanesia there are phratries, sometimes anonymous, with no totems; in other tribes traces of totemism survive. In some totemic parts of Africa the totem restriction is rapidly breaking down. The religious regard for the totem, or what has been the totem, is most in view sometimes (as in Samoa) where the social functions of the totem are dead or dying; while there is a decline of the rule of respect for the totem in regions where its social aspect is most conspicuous—for example, in the Euahlayi tribe of New South Wales.

Myths of the Origin of Totemism.—Light on totemism has been sought in the myths of totemists. But these are in all cases mere savage explanatory myths, and science has invented no hypothesis, including our own, which has not a parallel among the guesses of men themselves totemic. No historical student could expect anything better, but anthropologists have been more sanguine, and they have sought for history where history cannot be found.

NOTES TO THE FOREGOING ARTICLE.—Since the preceding article was written, by the publication of his researches in Melanesia (*History of Melanesian Society*, 1914), Dr Rivers has thrown an entirely new light on the three subjects dealt with by Mr Lang: (1) the dual organisation of society; (2) totemism; and (3) kinship terms or terms of relationship. See KIN.

I. (*a*) Melanesian evidence makes it probable that the dual organisation, or division of a tribe into two phratries or moieties, is due to the coalescence of two distinct peoples; the dual organisation is also found in Australia, North America, and parts of Africa; there is some ground for supposing that, at any rate in Australia and parts of North America, two peoples coalesced—as in Melanesia—and that the names of the moieties or their attributes indicate the physical characteristics of these peoples.

It is an essential part of Dr Rivers's theory that the immigrants who coalesced with the aborigines to form the dual organisation were comparatively few in number, and, having few women with them, were compelled to intimacy with the natives (especially if there were an objection to the intermarriage of near relatives). How far these conditions would apply in continental areas is uncertain; in the absence of detailed information, it is useless to theorise on the origin of the dual organisation in such regions.

(*b*) In Melanesia the dual peoples are matrilineal—i.e. the child belongs to the same phratry, moiety, or social group as the mother. This kind of descent is a common feature of totemism, as Mr Lang indicates; but Dr Rivers (ii. 568) gives reasons for supposing that matrilineal descent is not necessarily primitive; it may be due to the coalescence of two patrilineal peoples, reckoning descent through the father. This change in the system may have originated in a condition of sexual communism (see MARRIAGE) which grew up as a result partly of the clash of cultures, partly of the monopoly of women by the old men. Here, again, it is impossible to generalise as to the history of society in other areas without more exact knowledge.

II. (*a*) Mr Lang has alluded to the fact that Dr Wilken, basing his conclusions on evidence from Indonesia, traced the origin of totemism to primitive views of the lot of the human soul after death. Dr Rivers, basing himself on Melanesian facts, comes to the same conclusion; and the agreement of these two authorities is of importance, because Indonesia was deeply influenced by the same people that Dr Rivers supposes to have given rise to totemism in Melanesia.

(*b*) We find in Melanesia three kinds of totems—birds, aquatic animals, and plants; and these kinds are in some cases so associated that a single clan has one or more of each kind; these 'linked totems' appear to be due to successive settlements of the people to whom totemism is due; the three kinds of totemism perhaps correspond to three varieties of funeral rites—cremation seems to be associated with land totemism, and throwing into rivers with aquatic totems.

(*c*) Totemism was not introduced as a ready-made system; all that the immigrants brought was the belief, or at any rate practices capable of leading to the belief, that the souls of the dead migrated into certain animals, and the rule that a man transmitted to his children the association with a definite species of animals or plants. These immigrants, mingling with the dual people (see *ante*), were absorbed into them or absorbed them, according to their relative numbers, forming for the most part matrilineal peoples, though peoples who reckon descent through the father are found where the immigrants and their descendants ceased intermarriage with the aborigines after the first generation.

(*d*) Dr Rivers supposes that totemism, as a developed system, resulted from the interaction of a body of immigrants and the aborigines whom they found in Melanesia. Here, again, further research is required before we can assert that this theory can be applied to account for totemism all the world over. If Dr Rivers's theory is correct, totemism is a relatively late development in Melanesia; if we suppose that similar conditions lay at the root of totemism in America and Africa, we can hardly attribute this to the interaction of the same peoples. But inasmuch as the essential feature of totemism is the association of an animal species with an exogamous clan, it is by no means axiomatic that the association everywhere arose in the same way. It appears to be established that in Fiji two wholly independent forms of totemism exist side by side.

(*e*) The association of exogamy with totemism seems to be due in Melanesia to one of two causes: (1) the influence of the matrilineal dual organisation; (2) the existence of a rule against intermarriage within the clan formed by descendants of a given male ancestor. The first of these operated in existing matrilineal areas, the second in patrilineal areas. To explain the matrilineal descent of the totem in other regions of the world on Dr Rivers's theory, we must suppose (*a*) that the dual or some other matrilineal organisation everywhere preceded totemism; or, alternatively (*b*), that sexual communism, or some similar cause, brought about a change from an original patrilineal to a matrilineal system. Otherwise we must believe (*c*) that a woman handed down a belief that a given species was intimately associated with her descendants in the female line; or else (*d*) that such a belief was inherited from the mother's brother.

III. Mr Lang asserts in his article that in Australia there are three systems of marriage regulation, varying in complexity. It has been pointed out (Thomas, *Kinship and Marriage*, p. 93) that this assumption is erroneous; whether there are two, four, or eight exogamous sections in a tribe, the restrictions on marriage are the same; rules are laid down as to the relationship in which spouses must stand.

IV. Generally speaking, in the literature of totemism two distinct ideas are confused: (1) the magico-religious society, and (2) the social (kinship) group. Until one or other definition is adopted, or the two ideas are shown to be in practice indissolubly connected, the term totemism is better avoided; the phenomena should be described in unambiguous language, and, if need be, native terms used in each area may be adopted as a substitute for the word totemism.

Totila (*d.* 552), king of the Ostrogoths. See Goths, Belisarius, Narses.

Totleben. See Todleben.

Totnes, a municipal borough and market-town of Devonshire, pleasantly situated on the slope of a steep hill on the right bank of the Dart, 29 miles SSW. of Exeter and 24 ENE. of Plymouth. The Dart is navigable to this point for vessels of 200 tons, and Brut the Trojan is fabled to have landed here; the 'Brutus Stone,' on which he first set foot, may be seen in the main street. At least, Totnes is a place of great antiquity, and retains two gateways, remains of the walls, a quaint guildhall, a good many antique houses, and an interesting Perpendicular church (1432; restored by Scott, 1874), with a noble red sandstone tower and a fine stone screen. The Norman castle of Judhael de Totnes is represented by the circular shell-keep that crowns the hill-top. There is a grammar-school (1568); and on the 'Plains,' near the river, stands a granite obelisk to the Australian explorer Wills, who was a native, as also was the Hebraist Kennicott. Incorporated by King John, Totnes returned two members till 1867. Pop. 4000.

Totonicapam, a town of Guatemala, on the plateau, 12 miles ENE. of Quezaltenango, was in 1838–40 capital of a small republic of the same name; pop. 4000.

Tottel, Richard, publisher, issued mostly law-books from his shop, at the Hand and Star within Temple Bar, from 1553 to his death in 1594. He is best known, however, as the publisher of the first and most important of the anthologies of his time, *Songs and Sonnets*, commonly called *Tottel's Miscellany*, which appeared in 1557, and passed through many editions. To this collection we are mainly indebted for the preservation of the lyrics of Wyatt, Surrey, and other practitioners of the new art of poetry.

Tottenham, an urban district and parliamentary borough (two divisions) of Middlesex, a northern suburb of London, contains a cross (*c.* 1600) and the site of the castle of the Bruces; pop. 147,000.

Tottington, a cotton-spinning urban district of Lancashire, 4 miles NE. of Bolton; pop. 7000.

Touareg, Tuareg, or Tawarik, a name (not used by themselves) for a nomadic people inhabiting central and western Sahara, between the Moors in the west and the Tibu in the east. The Arabs speak of them as Sanhaja-an Litham ('the people of the veil'), from the *litham*, a sort of turban, dark blue among the nobles, white among the common people or serfs, of which the end is worn constantly over the face possibly as a protection against sand. Disguise on raids has been suggested as the origin of the custom. The women go unveiled. The warriors bear leather shields, muskets, long lances, and swords, and wear a stone ring on the arm to give momentum to their blows. The Touareg are of southern European ('Mediterranean') type, Berber in language. Christian till the coming of the Arabs, they are

now Mahommedan, but take their religion lightly. The position of women is higher than among the Arabs. One tribe, the Aouraghen (Afrigha), is thought by some to have given its name to the continent. See BERBERS, SAHARA; F. Rennell Rodd, *People of the Veil* (1926).

Touat, TUAT, or TWAT, a Berber name for a group of oases in the south-west of Algeria. The name is used somewhat vaguely. It is applied especially to those east of the Wadi Saura, in the neighbourhood of the twenty-seventh parallel of north latitude. Tidikelt and Gurara are commonly included. Touat proper lies between these. Dates and grain are produced. There is a great salt lake in Gurara. The people are Arabs, Berbers, and negroes, with many of mixed race. The region was Moroccan till 1900–1, when it was conquered by the French.

Toucans (*Rhamphastidæ*), a family of Zygodactyle Picarian birds, numbering more than fifty species, and inhabiting tropical America. They were formerly placed near the Hornbills (Buceroti dæ), which offer several points of analogical resemblance to them, and are often improperly called toucans in the East (perhaps from the similarity of the names: Tupi *tucana*, a 'toucan,' Malay *tukang*, a 'hornbill,' literally 'a workman,' from its noisiness); but their nearest allies are now known to be the Barbets (Capitonidæ), one of which, *Tetragonops rhamphastinus*, strongly resembles a toucan in its coloration, &c. The toucans are divided into five genera: *Rhamphastos*, containing the typical species, has the bill most greatly developed, and the plumage mostly black, varied with white, scarlet, and orange; *Andigena*, containing the Hill Toucans, inhabiting the high forests of the Andes, and with a generally bluish-gray plumage; *Pteroglossus*, with smaller, long-tailed species, clothed in green, scarlet, and yellow plumage, and called Araçaris; *Selenidera* includes the Toucanets, which are very similar; the species of the last genus, *Aulacorhamphus*, are of a bright-green colour. The legs of the toucan are strong, rather short, and with large scales; the toes are arranged in pairs, the first and fourth being turned backward. The form of the body is short and thick; the tail is rounded or even, varying in length in the different species from half the length to almost the whole length of the body, and is capable of being turned up over the body in a remarkable manner, which it always is when the bird is at roost. The neck is short and thick; the enormous bill is at the base of the full width and depth of the head, and is in some species more than half the length of the body. It is arched towards the tip, irregularly toothed along the margins of the mandibles, and extremely cellular and light, yet strong in structure. The tongue is very long, narrow, and singularly feathered on each side, the processes which give it this feathered appearance possibly adding to its sensibility as an organ of taste. When a toucan takes food between the points of the mandibles, the tongue is immediately applied to it, as if to test or enjoy it, and afterwards it is tossed into the throat by a sudden throwing back of the head. Toucans may almost be described as omnivorous; they eat fruits with avidity, but they also seize and devour small birds. Their powerful bill enables them to kill a small bird by a single squeeze. They make a curious clattering noise with their great mandibles, and also emit at times a harsh cry, sometimes resembling the word *tucano*, whence perhaps their name. They live chiefly in the depths of the South American forests, in small flocks, and lay two white eggs in the holes of trees. They are easily tamed, and bear cold climates well. In captivity they readily eat rice, bread, potatoes, eggs, and many other kinds of food. They are remarkable amongst birds for regurgitation of food, which is subjected to a secondary mastication, analogous to rumination. The colours of the bill are, in most of the species, very brilliant during life, but disappear from stuffed specimens in museums. The largest species, as *Rhamphastos toco*, are about two feet in length; the *R. ariel* is the commonest species. See Gould's *Monograph* (2d ed. Lond. 1854).

Touch, or the sense of contact or pressure, like sensations of pain, heat, and cold, from which it has to be distinguished, is elementary, and cannot be split up into simpler components. It enables us to appreciate the slightest mechanical contact of external objects on the surface of our body independent of their temperature. Sensations of simple contact and pressure sensations are both due to deformation of the cutaneous surface, and therefore represent different degrees of a single quality of sensation. It is best elicited in a pure form by contact with a fine brush or wisp of cotton-wool, the mere movement of one of the skin hairs being sufficient to give the characteristic sensation. The deformation of the skin surface necessary may be of the slightest character and almost imperceptible. Examination by the binocular microscope shows that the surface of the skin is not rigid as might be supposed, but is mobile, and behaves to a light touch like an extremely thin membrane floating upon a fluid. The impulses so generated pass to the central nervous system by the sensory nerves. Nerve impulses are not readily produced by direct mechanical stimulation of nerve fibres;

Meissner's Corpuscle in a papilla from the skin of the hand. Highly magnified. Note the terminal varicose ramifications of the nerve fibres.

n, n, Two nerve fibres passing to the corpuscle.

under ordinary conditions they are produced by the activity of receptor organs situated at the periphery of these nerves in the skin. In man the peripheral fibrils pass to the epithelial cells of the skin, and terminate among or even in the cells of the deeper layers. In many cases these nerve fibrils ramify and form a plexus in the superficial layer of the skin. We know nothing of the nature of the process by which the actual excitation takes place. Deformation of the skin surface probably does not excite the nerve fibrils directly; it is

more likely that the epithelial cells themselves act as receptor organs, and, when excited by contact, transmit to the nerve fibrils a stimulus which originates a nerve impulse in them. The sheaths of the skin hairs are surrounded by nerve-rings which are capable of excitation by mechanical agents a thousand times weaker than those necessary for the direct excitation of the nerves. In regions where there are no hairs elaborate terminations to the peripheral fibrils are found, known as Meissner's corpuscles. Their structure is complex and very variable; the axis cylinder of the fibril usually forms a spiral coil with a number of irregular convolutions and varicose enlargements. They are found specially in the hands and feet. Their superficial position in the skin corresponds to the sharp demarcation of tactile points. Appreciation of touch is lost in cutaneous scars.

A careful examination of the skin shows that it consists of a mosaic of tiny spots, each reacting to one type of stimulus only, and known as 'touch spots,' 'pain spots,' heat spots,' and 'cold spots.' It is probable each is served by a separate type of end-organ. The sensitiveness of the skin to touch varies in different parts of the body, the most sensitive parts being the tip of the tongue, the red parts of the lips, and the ends of the fingers. See SENSATION.—Touch as a means of perception is dealt with at PSYCHOLOGY; touching for the king's evil, at SCROFULA.

Touch-me-not, a name given to two plants with explosive fruits, *Impatiens noli-me-tangere* (see BALSAM), and the squirting cucumber (*Ecballium elaterium*), which furnishes the drug Elaterium (q.v.).

Touch-paper. See NITRE.

Touch-stone, a hard black stone, occasionally used in assaying. The original kind was a peculiar bituminous quartz or flinty slate obtained from Lydia in Asia Minor, and hence known as Lydian Stone; but black basalt may be employed. The process is explained at ASSAYING.

Touch-wood is the wood of willows and some other trees softened by decay; Amadou (q.v.) is also so called. It is used as tinder, from the readiness with which a spark ignites it.

Touggourt, or TUGGURT, a town on an oasis of the Sahara, in the Southern Territories of Algeria, about 120 miles S. of Biskra, with which it is connected by railway. There is some trade in dates. Pop. 2000. The territory of Touggourt (including Biskra) has 213,000 inhabitants.

Toul, a fortified town in the French department of Meurthe-et-Moselle, on the Moselle, 20 miles W. of Nancy by rail. It has a former cathedral (965–1496), whose west front, with towers 245 feet high, is reckoned one of the finest in France, an 18th-century hôtel-de-ville, and manufactures of lace, hats, &c. The *Tullum Leucorum* of the Romans, Toul maintained a semi-independence till 1545; on 23d September 1870 surrendered to the Germans after an eight hours' bombardment; but held out in 1914. Since 1871 it has been strongly fortified with a cordon of forts. Pop. 12,000.

Toulon, a seaport and naval arsenal of France, in the department of Var, stands on the shore of the Mediterranean, 42 miles ESE. of Marseilles and 564 SSE. of Paris. It lies at the head of a deep double bay, and rises towards the north in the form of an amphitheatre. The port is divided into two parts, the old and the new—the former, on the east, appropriated to merchant shipping, and the latter, on the west, surrounded by the dockyard, slips, arsenal, cannon-foundry, &c. Belonging to the arsenal, which is perhaps the finest in France, are the sailyard, armoury, museum, &c. The fortifications were greatly extended after the conquest of Algeria (1830), Toulon becoming the chief port of communication with Africa; and important works of defence have been added since 1880. Toulon exports bauxite, and imports wine and coal. A cathedral, founded in 1096, the hôtel-de-ville, and a large theatre are the chief buildings. The climate is dry and bracing; but the older portions of the town are still unsanitary. Pop. (1872) 69,808; (1911) 104,582; (1921) 106,331; (1926) 115,120. The Greek *Telonion* and Roman *Telo Martius*, Toulon suffered much from the Saracens, and first rose into importance as a naval stronghold towards the close of the 16th century. The English were defeated off Toulon by the united fleets of France and Spain, 11th February 1744; and in 1793 it was occupied for four months by the English (under Hood) and the Spaniards, who, however, were forced to evacuate the place after being fiercely attacked by the Republicans—a memorable siege as the first great achievement of Napoleon (q.v.).

Toulouse, an important city in the south of France, the capital anciently of Languedoc, and now of the department of Haute-Garonne, 160 miles SE. of Bordeaux and 466 S. by W. of Paris. It is situated in a broad and pleasant plain, on the right bank of the river Garonne, with the Canal du Midi sweeping round its eastern and northern sides. The Garonne is crossed here by a beautiful bridge (1543–1626), nearly 300 yards long, which connects Toulouse with the suburb of St Cyprien. Built of red brick, '*la ville rose*,' with the exception of the southern faubourg, is not particularly handsome (though the broad quays have rather an imposing appearance), nor has it many fine public buildings. One may note, however, the cathedral, containing the tombs of the Counts of Toulouse; the Capitole, or town-hall (1769); the Romanesque church of St Sernin (11th to 15th century), with relics of six apostles and many other saints; and the Musée, with its cloisters and its interesting collection of antiquities, forming an almost uninterrupted chain in the history of art from the Gallo-Roman to the Renaissance period. The lofty tower of Notre Dame de la Dalbade, a 16th-century church, fell in 1926. Toulouse is the seat of an archbishop, has a university, an academy of 'floral games' (*Académie des Jeux Floraux*), claiming to date from a troubadour's contest in 1323, academies of arts, sciences, antiquities, &c., schools of law, medicine, and artillery, an observatory, botanic garden, and public library. Toulouse manufactures woollens, silks, leather, cannon, steam-engines, tobacco, brandy, &c., and carries on a great trade with Spain. Its liver and truffle pies are celebrated throughout the south of France. Pop. (1872) 114,025; (1911) 149,576; (1921) 175,434; (1926) 180,771.

Tolosa was in Cæsar's time a city within the limits of the Roman *provincia*, and had been originally the capital of the Volcæ Tectosages, a Gallic tribe noted for its wealth and consequence. Under the empire its importance continued. Ansonius describes it as surrounded by a brick wall of great circuit, and so populous that it had founded four colonies. In 412 A.D. the Visigoths made it the capital of their kingdom (see GOTHS); and after the time of Charlemagne it was under the sway of counts, who made themselves independent about 920, but in 1271 the 'county of Toulouse' was reunited to the crown of France by Philippe le Hardi. Its literary celebrity reaches as far back as the Roman empire. Ausonius speaks of the *toga docta* of 'Palladian' Tolosa, and the favourite deities of the city were Jupiter, Minerva, and Apollo. At a neighbouring village a multitude of cinerary urns, statuettes,

Phœnician, Celtiberian, Gallic, Greek, and Roman medals, fragments of buildings, and an entire paved street have been discovered. Early in the middle ages, under the Counts of Toulouse, it became a seat of Provençal poetry, and it suffered terribly in Simon de Montfort's pitiless papal crusade against the Albigenses (q.v.). The parliament of Toulouse had a great reputation, but unhappily it is likely to be best remembered by one of its most iniquitous decisions, that delivered in the case of the Calas (q.v.) family. In the battle of Toulouse (10th April 1814) the French under Soult were defeated by Wellington. Cujacius was born, and Fermat died, at Toulouse. The floods of 1855 and 1875 were specially disastrous.

Toulouse-Lautrec-Monfa, Henri de, French caricaturist and grotesque poster artist, was born in 1864 at Albi, son of the Comte de Toulouse-Lautrec. Physically weak and sensitive about his deformity—he had broken both legs—he lived in solitude, drank in excess, became insane, and died in 1901.

Toungoo, a town of Burma, on the Sittang River, 170 miles NE. of Rangoon by rail, and capital of a district of Tenasserim; pop. (1921) 19,332.

Touquet, Le, a French golfing and bathing resort, in the department of Pas-de-Calais, near Étaples (q.v.).

Touraco. See Plantain-eaters.

Touraine, one of the old provinces of France, of which the capital was Tours (q.v.), and which coincided with the department of Indre-et-Loire and a part of Vienne. See books on Touraine by Robida (1892) and Anne Macdonell (1906).

Tourane, or Turan, a port of Annam, 50 miles SE. of Hué. There are coal-mines near.

Tourcoing, a town of France, department of Nord, on the Belgian frontier, 8 miles NE. of Lille, has manufactures of cloth, soap, beet-sugar, and machinery. It was in German hands in 1914–18. Pop. (1881) 50,268; (1901) 61,058; (1911) 82,644; (1921) 78,600.

Tourguénieff. See Turgenev.

Tourmaline, a mineral which has a very complex and somewhat variable chemical composition. The chief constituents are silica and alumina in nearly equal proportions, and forming about three-fourths of the whole. The remainder consists of boracic acid, ferrous oxide, manganous oxide, magnesia, lime, soda, potash, and lithia, which are not all present, however, in any specimen. Tourmaline has a hardness of 7 to 7·5, and is thus harder than quartz, but not so hard as topaz. Its specific gravity is 2·94 to 3·3. It crystallises in rhombohedral forms, which are usually hemihedral, the prisms being often triangular or six-sided, and variously acuminated. The mineral has a vitreous lustre, and varies from transparent to opaque. The most common colours are black, brownish black, and bluish black; blue, green, and red varieties also occur; but white or colourless kinds are rare. Red tourmaline is known as *rubellite;* pale blue or bluish black as *indicolite;* Berlin-blue and transparent as *Brazilian sapphire* (in jewellery); green and transparent as *Brazilian emerald, chrysolite,* or *peridot of Brazil;* honey-yellow as *peridot of Ceylon;* colourless as *achroite;* black as *schorl.* Tourmaline occurs frequently in drusy cavities in granite, and also as an accessory mineral in granite, gneiss, and many crystalline schists, as also in certain granular dolomites and crystalline limestones associated with schists and plutonic rocks. Not infrequently it occurs along with various precious stones in the sands and alluvia derived from the disintegration of plutonic rocks and crystalline schists, as in Ceylon, Siberia, and Brazil. Various kinds are found in the Shan districts of Burma. The finest tourmalines are much valued by jewellers, but are comparatively rare. The black variety, *schorl,* is common in many of the granites and schists of Britain.

Tournament, a military sport of the middle ages, in which combatants engaged one another with the object of exhibiting their courage, prowess, and skill in the use of arms. Spectacles of this kind seem first to have become common in France, whence the usage spread to Germany and England, and afterwards to the south of Europe. A tournament was usually held on the invitation of some prince, who sent a king-of-arms or herald through his own dominions and to foreign courts. The intending combatants hung up their armorial shields on the trees, tents, and pavilions round the arena for inspection, to show that they were worthy candidates for the honour of contending in the lists in respect of noble birth, military prowess, and unspotted character. The combat took place on horseback, or at least was always begun on horseback, though the combatants who had been dismounted frequently continued it on foot. The usual arms were blunted lances or swords; but the ordinary arms of warfare, called arms *à outrance,* were sometimes used by cavaliers who were ambitious of special distinction. Tournaments were the subject of minute regulations, which in some degree diminished their danger. The prize was bestowed by the lady of the tournament on the knight to whom it had been adjudged, he reverently approaching her, and saluting her and her two attendants. The period when tournaments were most in vogue comprised the 12th, 13th, and 14th centuries; and the place where the most celebrated English tournaments were held was the tiltyard near St James's, Smithfield, London. The church at first discountenanced tournaments, some of its decrees prohibiting persons from engaging in them under pain of excommunication, and denying Christian burial to a combatant who lost his life in one. The church seems, however, to have looked with more favour on these combats after the middle of the 13th century. During the 15th and 16th centuries tournaments continued to be held; and no better conception of a tournament can be gained than from the account of the combat at Stirling in 1448 between the knight-errant Jacques de Lalain and the Master of Douglas (Hume Brown's *Early Travellers in Scotland,* 1891). But by 1500 the alteration in the social life and warfare of Europe had changed their character, and they are rather to be regarded as state pageants than as real combats. The death of Henry II. of France, in 1559, consequent on a lance piercing his eye at a tournament, led to their general abandonment, both in France and elsewhere, and there have been few attempts to revive them even as mere spectacles. The progress of firearms helped also to put them out of fashion; but tournaments still took place in the reign of James I., and at the Hague in 1633 the Prince of Orange held a 'passage of arms,' in which Prince Rupert 'carried away the palme.' A magnificent entertainment consisting of a representation or imitation of the old tournament was given at Eglinton Castle in August 1839, by the thirteenth Earl of Eglinton: Lady Seymour was the Queen of Beauty, and many of the visitors enacted the part of ancient knights; among them Prince Louis Bonaparte, afterwards Napoleon III. —According to Ducange, the difference between a tournament and a joust is that the latter is a single combat, while in the former a troop of combatants encounter each other on either side. But this distinction has not been always observed.

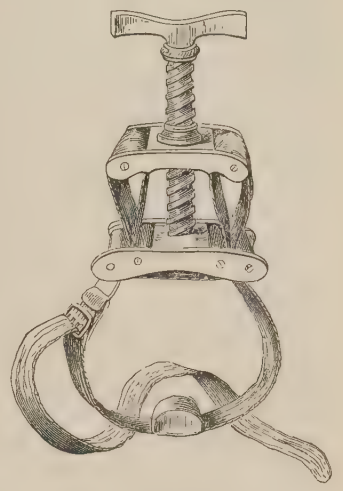
Tournay (Flemish *Doornik*), a town in the Belgian province of Hainault, on the Scheldt, near the French frontier, 35 miles WSW. of Brussels. Its splendid Romanesque cathedral, 400 feet long, has five towers and pictures by Jordaens, Rubens, and Gallait; and there are also the churches of St Quentin and St Brice (with the grave of King Childeric), the belfry (1190), and a bronze statue (1863) of the Princess d'Épinoy, who in 1581 valiantly defended Tournay against Parma. Although one of the oldest towns in Belgium, it has quite a modern appearance, with fine suburbs and beautiful broad streets. The chief manufactures are hosiery, linen, Brussels carpets, and porcelain; but there are few large workshops, most of the fabrics being executed by the people in their own houses. Pop. (1880) 32,566; (1920) 36,410. Tournay, the ancient *Tornacum* or *Turris Nerviorum*, was in the 5th and the beginning of the 6th century the seat of the Merovingian kings, subsequently belonged to France, but in 1526 was included in the Spanish Netherlands. During May 1794 it was the scene of several hotly contested fights between the French and Austro-English armies, the most important of which was that of the 19th May, in which Pichegru beat the Duke of York. Fontenoy (q.v.) is 5 miles SE.

Tournefort, Joseph Pitton de (1656–1708), botanist, was born at Aix, travelled in Greece and elsewhere, and died professor in the Collège de France. His botanical system maintained its ground till the time of Linnæus, who to a great extent built upon his foundation, and his principal works were *Institutiones Rei Herbariæ* (1700) and *Éléments de Botanique* (1694).

Tourneur, Cyril, a dramatist, who flourished at the close of the reign of Elizabeth and the beginning of that of James I., but of whose history absolutely nothing is known beyond the fact (*Acad.* May 9, 1891) that he had seen service in the Low Countries, and died in Ireland, leaving his widow destitute, February 28, 1626. In 1600 he published his *Transformed Metamorphosis* (discovered in 1872), a satirical poem, obscure in expression, and marred, moreover, by pedantic affectations of style; in 1609 he issued a *Funeral Poem* on Sir Francis Vere, in 1613 an *Elegy* on Prince Henry. But his fame rests alone on two plays, the *Revenger's Tragedy*, licensed and printed in 1607, and the *Atheist's Tragedy*, printed in 1611, but undoubtedly written the earlier of the two. The plot of the latter is poor, though the versification is free and flowing; but when we turn to the *Revenger's Tragedy* we are at once arrested by its tragic intensity, the condensed power of passion, the fiery strength of phrase, the cynical and bitter mockery. The plot is an entangled web of lust and blood in which the dramatist moves with a mastery of the elements of tragic passion that brings him abreast of Webster, the closest of the followers of Shakespeare in one—but that not the greatest—of his moods. Tourneur's power has not escaped the unerring insight of Lamb and Hazlitt. Fleay (*Biographical Chronicle of the English Drama, 1559–1642*) thought the *Revenger's Tragedy* the work of the author of the *White Devil*.

The only complete edition is that of J. Churton Collins (2 vols. 1878), with a good critical introduction; the two plays are printed, together with Webster's *White Devil* and *Duchess of Malfi*, in the 'Mermaid' series, with an introduction by J. A. Symonds (1888).

Tourniquet, an instrument for compressing the main artery of the thigh or arm, either for the purpose of preventing too great a loss of blood in amputation, or to check dangerous hæmorrhage from accidental wounds, or to stop the circulation through an aneurysm. For the last purpose special forms of tourniquet are required, which do not compress the whole limb. The tourniquet is of various types. The original form consisted of (1) a pad to compress the artery; (2) a strong band which is buckled round the limb; and (3) a bridge-like contrivance over which the band passes, with a screw whose action raises the bridge and consequently tightens the band. The best kind of pad is a small firm roller bandage, about an inch thick; it must be placed lengthways over the main artery so as to compress it against the bone, and must be secured in its place by a turn of bandage, over which the band of the tourniquet must be applied. This band must first be tightly buckled, and the pressure must be then quickly increased to the necessary extent (viz. till the circulation through the limb is completely arrested) by the action of the screw, which should always be opposite the buckle of the band.



Common Tourniquet.

The credit of the invention of this most useful instrument is usually ascribed to the French surgeon Morel, who, in 1674, used a stick passed beneath a bandage, and turned round so as to twist it up to the requisite degree of tightness, as a means of preventing the undue loss of arterial blood in amputations of the limbs—a rough but by no means ineffectual form of tourniquet, which may often be usefully extemporised in cases of emergency at the present time (see Bandages). Mr Young of Plymouth, in 1679, described a similar apparatus. The improved screw tourniquet described above was invented by Petit in 1718. Many surgeons now use in preference a strong elastic band, wound two or three times round the limb—a method first introduced by Esmarch; or a rubber tube of which the ends are caught in a notched block of wood.

Tours, capital of the department of Indre-et-Loire, as it formerly was of the province of Touraine, stands in the fertile valley of the Loire just above the influx of the Cher, and is 147 miles SW. of Paris by rail. It is a regularly built and handsome town, nearly divided in half by the Rue Nationale. Conspicuous amongst its buildings is the noble cathedral, in various styles of Gothic from the 13th to the 15th century, the two towers (partly modified Renaissance) being 205 feet high. The glass is very fine. Other buildings are the church of St Julien, the towers and other remains of the famous abbey church of St Martin (long a place of pilgrimage, but destroyed at the Revolution), the archbishop's palace, palais de justice, museum, public library, &c. Near the town are the remains of the monastery of Marmoutier, and of the castle of Plessis lez Tours, the favourite residence of Louis XI. (see *Quentin Durward*). There are some well-preserved ancient houses, including that of the executioner Tristan l'Hermite. Near Tours are many of the fine old châteaux for which Touraine is famous. There are fine statues of Descartes and Rabelais. Tours has a brisk

trade, manufactures woollens and silk, does much printing, &c., and is famous for its plums and similar confections. Pop. (1872) 43,368; (1901) 58,409; (1921) 75,096. The Roman *Caesarodunum*, Tours was both earlier and later capital of the Turones (whence the modern name). Near it Charles Martel (q.v.) won the great victory that saved northern Europe from the Saracens. Meetings of the States-general and councils repeatedly took place here. The great silk manufactures of Tours, established in the 15th century, were destroyed by the Revocation of the Edict of Nantes (1685), which drove into exile nearly half of the most industrious inhabitants of the place. During the Franco-German war Tours was the seat of government from the time the Germans closed round Paris till (21st September) they in like manner closed round and then occupied Tours. St Martin and Gregory of Tours have separate articles.

Tourville, Anne Hilarion de Cotentin, Count de, was born at the chateau Tourville, near Coutances, 24th November 1642. Entering the French navy, he became, though of delicate health, almost immediately conspicuous for bravery and enterprise; and his early services in wars against the Turks and Algerines established his reputation. In 1677 he fought against the combined fleets of Spain and Holland. In the war which broke out after the English revolution of 1688, between France on the one part and England and Holland on the other, Tourville was put at the head of the French navy. In June 1690 he entered the English Channel with a powerful fleet, and inflicted a disastrous and ignominious defeat on the united English and Dutch armament near Beachy Head. Tourville ranged the Channel unopposed; and on 22d July his fleet cast anchor in Torbay. In 1692, Louis XIV. having resolved to invade England on behalf of James II., an immense fleet was assembled at Brest under Tourville in order to protect the descent. On the 16th May of this year the French fleet was descried from the cliffs of Portland, and on the following morning the English and Dutch force stood out to give battle. From the morning of the 19th to the afternoon of the 24th raged one of the greatest naval battles of modern times, that of Cape La Hogue (see Tactics, Naval). It ended in the complete defeat of the French, sixteen of their men-of-war being utterly destroyed. In spite of this disaster Tourville was graciously received at Versailles, as having maintained the honour of his country, and was made a Marshal of France. Sailing from Brest harbour in the spring of this year, he attacked an English merchant fleet under inadequate convoy, and succeeded in inflicting a damage on English traders estimated at some millions sterling. Sir George Rooke, who commanded the convoy, had some difficulty in saving his own squadron from destruction. This was the last exploit of the great French admiral; he died at Paris, 28th May 1701.

The *Mémoires* published in his name (1758) were not genuine. See Macaulay's *History;* and Delarbre, *Tourville et la Marine de son Temps* (1889).

Toussaint l'Ouverture (a surname added for his bravery in once making a *breach* in the ranks of the enemy), one of the liberators of Hayti, was born a slave in 1743, joined the negro insurgents in 1791, and at length in 1795, for his services against the Spaniards, was made by the French Convention general of brigade, in 1797 general of division, and a little later chief of the army of San Domingo. Soon after he cleared the British and Spaniards entirely out of the island, quickly restored order and prosperity, and about 1800 began to aim at independence of France. Bonaparte having, after the peace of Amiens, proclaimed the re-establishment of slavery in San Domingo, Toussaint declined to obey, whereupon General Le Clerc was sent with a strong fleet to compel him. The liberator soon submitted, but was treacherously arrested, sent to France, and flung into a damp, dark dungeon at Fort de Joux, near Besançon, where he sank after ten months, 27th April 1803. See his own *Memoires* (1853), and Lives, also in French, by Saint-Rémy (1850), Gragnon-Lacoste (1877), and Schœlcher (1889).

Tout, Thomas Frederick, historian, was born at London in 1855, was educated at Balliol, Oxford, and became professor of history at St David's College, Lampeter (1881–90), and at Manchester (1890–1925). His works include *Edward I.* (1893), *Edward II.* (1914), *Administrative History of Mediæval England* (2 vols. 1920), *France and England* (1922), and several text-books.

Tovey, Donald Francis, musician, was born at Eton in 1875. For a time he studied under Parratt, Higgs, and Parry; he obtained the first Nettleship Scholarship at Balliol, Oxford, made his début with Joachim in 1894, in 1914 was appointed professor of music at Edinburgh, and in 1917 organised there the Reid Orchestra. Tovey has made concert tours as pianist in America and on the Continent, and has achieved a great reputation as an intellectual musician, a savant, and a writer of musical analyses. His compositions, which include an opera, a symphony, a piano concerto, and much chamber music, are scholarly.

Tow, the coarse or broken part of flax or hemp separated by heckling. See Linen.

Tower. See Campanile, Spire, and the articles on the various styles of architecture; also Pisa, &c.

Tower Hamlets, originally certain parishes, hamlets, and liberties without the jurisdiction of the city of London, and once within that of the lieutenant of the Tower; later a 'parliamentary borough' or division of London, lying to the east of the City and Finsbury. Till 1885 it sent two members to parliament; from that time till 1918 the divisions of Whitechapel, St George's-in-the-East, Limehouse, Mile-End, Stepney, Bow and Bromley, and Poplar each returned one member. These were then grouped anew as the boroughs of Stepney (three divisions) and Poplar (two divisions).

Tower of London. See London, p. 737.

Townley Plays. See Mysteries and Miracle Plays; Wakefield.

Town-council, the governing body of a municipality. See Borough; also Alderman, Bailie, City, Mayor, Provost.

Town-planning. See Housing and Town-Planning, Satellite Towns.

Townshend, Charles, Viscount Townshend, statesman, was born in 1674, of a very old family, at Raynham in Norfolk. His father, Horatio, had been a prominent Presbyterian, but, having been one of the most forward in restoring the monarchy, was by Charles II. made Baron in 1661, and Viscount in 1682. He died in 1687, when Charles was only eleven years old. He, when of age to take his seat in the Upper House, entered public life as a Tory, but soon afterwards became a disciple of Lord Somers, and cordially co-operated with the Whigs. He was named by the Godolphin administration one of the commissioners for arranging the Union with Scotland; was joint-plenipotentiary with Marlborough at the Hague; and negotiated with the States-general the Barrier Treaty, which pledged the States-general to the Hanoverian succession,

and England to procure the Spanish Low Countries for the United Provinces, as a barrier against France. Dismissed from his places in 1712, on the formation of the Harley ministry, Townshend maintained a close correspondence with the court of Hanover, and obtained the entire confidence of George I., who, while still at the Hague, on his way to his new kingdom, made him Secretary of State. With Stanhope he formed a ministry entirely Whig, in which Walpole, his brother-in-law, soon became Chancellor of the Exchequer. The principal act of the government was the passing of the Septennial Bill (1716); that same year saw Townshend's dismissal. After the bursting of the South Sea Bubble, and the deaths of Sunderland and Stanhope, Townshend (1721) again became Secretary of State. But he was no longer the acknowledged leader of the Whigs. The superior talent of Walpole, his financial abilities, and his influence in the House of Commons caused a change in the relative position of the two ministers, and converted those who had been so long friends and colleagues into rivals and enemies. After Townshend had somewhat precipitately made the treaty of Hanover between England, France, and Prussia, an open and unseemly quarrel broke out between them. Walpole said he thought the firm should be Walpole & Townshend, not Townshend & Walpole; so it was, and Townshend retired into private life in 1730. He introduced the turnip into Norfolk from Germany, greatly improved the rotation of crops, steadily refused to reappear in public life, and died 21st June 1738. See works on Walpole, and Stanhope's *History*.

Townshend, CHARLES, wit, orator, and statesman, was second son of the third Viscount Townshend, and grandson of the foregoing. He was born 29th August 1725, and entered the House of Commons in 1747 as a supporter of the Pelham (Whig) administration. His first great speech was against the Marriage Bill in 1753. Upon the dissolution of the Whig government the Earl of Bute gained him by the offer of the post of Secretary at War; but on Bute's resignation in 1763 he was appointed First Lord of Trade and the Plantations—the versatility of his political career obtaining for him the appellation of 'the Weathercock.' In the Chatham ministry of 1766 he accepted the post of Chancellor of the Exchequer and leader of the House of Commons. When Lord Chatham in a distempered state of mind abdicated the post of first minister, Townshend manifested the greatest vanity, ambition, and arrogance. Finding the notion of an American revenue agreeable to the court, and not unpalatable to the House of Commons, he proposed and carried those measures of taxation of commodities in America that led to the separation of the American colonies. Townshend's wife was created a peeress, and he was about to be entrusted with the formation of a ministry when he was carried off by a putrid fever, 4th September 1767. The difference between his contemporary reputation and his fame is very striking. He was ranked as an orator with Pitt. Burke called him 'the delight and ornament of the House of Commons.' Macaulay speaks of him as 'the most brilliant and versatile of mankind,' who had 'belonged to every party and cared for none.' Earl Russell describes him as 'a man utterly without principle, whose brilliant talents only made more prominent his want of truth, honour, and consistency.' See his Life by P. Fitzgerald (1866).

Townshend, SIR CHARLES VERE FERRERS (1861–1924), major-general, after service in the marines in the Egyptian campaign of 1885, joined the Indian army, and sustained a forty-six days' siege in Chitral fort (1892). Another spell in Egypt followed. In 1915, in command of the 6th Division in Mesopotamia, he took Kut, and was besieged there after falling back from Ctesiphon. After five months he surrendered (1916). He was released from Prinkipo to negotiate for peace in 1918. Unemployed and aggrieved, he entered parliament for the Wrekin as an independent in 1920, but joined the Conservative party in 1922. Besides *My Campaign in Mesopotamia* (1920) he wrote the *Military Life* of his ancestor—George, first Marquess Townshend (1724–1807), field-marshal, who at the capture of Quebec took command after Wolfe fell, and was Lord-Lieutenant of Ireland 1767–72—a brother of Charles Townshend (see above).

Township, or VILL, the oldest proprietary and political unit of the Germanic races, an organised self-acting group of families exercising ownership over a definite area, the mark. The oldest English manors are conterminous with townships: the parish, a later division than the township, and originally purely ecclesiastical, is assumed to be equivalent to the township if there is no evidence to the contrary. In fact many parishes, especially in the north of England, consist actually of but one township; but generally they comprise more than one, and are subdivided into townships, hamlets, 'tithings,' 'boroughs,' or the like, none of which subdivisions, unlike the parish itself, has ever had a church or a constable of its own. For administrative purposes the township is subordinate to the Parish (q.v.).—In the United States the word is variously used (1) of a subdivision of a county; (2) the corporation composed of the inhabitants of such area; or sometimes (3) of municipal corporations only less fully organised and with fewer powers than a city.

Townsville, a port of Queensland on Cleveland Bay, in lat. 19° 10′ S., has foundries and breweries. Pop. (1921) 21,348.

Towton, a township in the West Riding of Yorkshire, where was fought, near Tadcaster (q.v.), one of the chief battles in the Wars of the Roses (q.v.).

Toxicology, the science of poisons, embraces the physical and chemical history of all known poisonous substances, the methods of testing for them, their action on the living body, and the *post-mortem* results they occasion; see POISON.—For *toxins* or bacterial poisons, see ANTITOXIN, and articles there noted.

Toynbee, ARNOLD, the second son of Joseph Toynbee, a famous aural surgeon, was born in London, 23d August 1852. At Oxford he became a prominent figure amongst an attached circle of students, studied political economy, and read in a miscellaneous fashion. 'Most men,' he said,' seem to lose their religious beliefs in passing through the university; I made mine.' He came under Ruskin's influence, did some practical work in road repairing, read his Bible diligently, and the *Imitation*. Endowed with the gift of fluent speech, he began to address audiences of working-men; and believing that the poor could only be adequately helped by those who had lived amongst them and felt their needs, he took up residence in Commercial Road, Whitechapel, in 1875, and associated himself with the religious work carried on there by the Rev. S. A. Barnett. His health gave way under his unwearied labours, and the noise, dullness, and dreariness of his surroundings, but from the inspiration of his example and teaching during this period sprang the idea of Toynbee Hall. He died in 1883, owing to overstrain following on two lectures directed against Henry George's *Progress and Poverty*. A course of lectures delivered at Oxford between 1881–82 on the economic history of England, along

with other popular addresses, was published in 1884 under the title of *The Industrial Revolution*, with Memoir by Jowett. Toynbee was frank and unreserved, of transparent sincerity, had a keen sympathy with the life of the labouring classes, and was a close student of history. The residence house known as Toynbee Hall was organised in Commercial Street, Whitechapel, as a memorial to Toynbee in January 1885, under the direction of the Rev. S. A. Barnett. It partakes somewhat of the nature of both a college and a club, the idea being to connect the memorial of Toynbee with the study of 'political economy in its social aspects, to which he devoted the scholar half of himself, and with his work among the artisan population of our great cities, to which he gave the other, the missionary half.' This is carried out by members of the universities of Oxford and Cambridge who strive 'to provide education and the means of recreation and enjoyment for the people, to inquire into the condition of the poor, and to consider and advance plans calculated to promote their welfare.' During the first four years there were fifty-four residents.

Toys. The most primitive toy of most abiding interest for children is the Doll (q.v.), already dealt with. But toys are of infinite variety, and the making of them forms a very important industrial occupation. Large numbers are made in London, Birmingham, and other places in Britain; but by far the greater number in Germany. Wax and china dolls are made in Sonneberg and elsewhere in southern Thuringia, very elaborate ones in Paris; wooden toys such as Noah's arks in the Erzgebirge; mechanical toys in Paris and Nürnberg; toy tea-sets in the Thuringian Forest. Squibs, crackers, &c., are somewhat dangerous toys (see PYROTECHNY), and there are many other ingenious applications of chemistry which combine amusement, instruction and risk—e.g. the so-called Pharaoh's Serpents (see THIOCYANATES), &c. A valuable use of what may be called toys is made in the Kindergarden (q.v.).

Tozeur, a town and oasis of Tunisia, on the Shatt el Jerid, 200 miles SW. of Susa, with which it connects by two railways. It is famous for dates.

Tracadie, a fishing-town on the east coast of the Canadian province of New Brunswick, 35 miles E. of Bathurst, with a hospital for lepers.

Tracery, the beautiful forms in stone with which the arches of Gothic windows are filled or traced for the support of the glass. These forms vary with every variety of Gothic architecture, from the simple early forms to the Decorated (q.v.) and Flamboyant (q.v.). See WINDOW, PERPENDICULAR, CHAPTER-HOUSE, &c.

Trachea, or WINDPIPE, that part of the air-passages which lies between the Larynx (q.v.) and the bronchi (see RESPIRATION). It is very rarely affected by disease of independent origin, though often secondarily by extension of laryngitis from above, or of bronchitis from below.

Foreign bodies occasionally pass through the larynx into the trachea. In cases of this kind the patient who has had some foreign substance in his mouth which is supposed to have been swallowed is seized with a convulsive cough, threatening suffocation, but subsiding after a time. The symptoms that then ensue vary with the weight and figure of the substance, and according as it is fixed or movable. A large and very irregular body may be impacted in the trachea, and may thus more or less obstruct the respiration on both sides of the chest; and this obstruction will probably soon be increased by the inflammatory products that are excited. A small heavy object will usually pass through the trachea into one of the bronchi (usually the right), or one of its branches, obstructing respiration to a less extent. While a foreign body remains in the air-passages there is always more or less risk of suffocation, though a piece of bone has been coughed up after sixty years in that situation. The attempt to remove it, however, has also risks; but such an operation is greatly facilitated by the use of the bronchoscope, an electrically-lighted tube by means of which the operator looks directly down the windpipe. If attempts at removal are unsuccessful the foreign substance may become encapsuled and quiescent; but it more often sets up organic lung disease (pneumonia, gangrene, &c.).

TRACHEOTOMY.—The air-passages may be opened in several different situations—viz. through the thyroid cartilage (*thyrotomy;* only used for removal of growths, &c.); through the crico-thyroid membrane (see LARYNX; *Laryngotomy*); through the cricoid cartilage and the upper rings of the trachea (*Laryngo-tracheotomy;* very rarely used); and through the trachea, either above or below the isthmus of the thyroid gland (*Tracheotomy* proper, *high* or *low*, according to the part chosen). Laryngotomy is more quickly and easily performed, especially in adult males, and is less dangerous; tracheotomy is a more difficult, tedious, and dangerous operation, but in some cases (as, for example, where there is any necessity for introducing the forceps) must be selected. It is unnecessary to enter into details regarding the modes of performing these operations. When the operation is completed a large curved double tube to breathe through is inserted in the aperture, and the outer tube is secured round the neck with a tape. The inner tube should fit quite loosely into the outer, so that if it becomes obstructed it may have a chance of being ejected by the patient's cough, and that it may be readily removed and cleaned. The tube may be removed in a few days, or may have to be worn permanently. Tracheotomy may be required for cut throat, laryngitis and other laryngeal disease, croup, diphtheria, tumours or epithelial growths in the larynx, foreign bodies below the glottis, or external tumours (bronchocele, abscesses, &c.).

Trachyte, a crystalline igneous rock, generally grayish in colour, sometimes brown, yellow, green, or red. It is usually a fine-grained or compact rock, more or less markedly porphyritic. The essential constituents of trachyte are sanidine (felspar), of which the rock is chiefly composed, and one or more of the ferro-magnesian bisilicates—biotite, augite, and hornblende; various other minerals may be present. The rock has often a rough or harsh feeling (Gr. *trachys*, 'rough'), due to the abundant presence of minute vapour or gas pores, or to angular cavities. Trachyte occurs both in the form of lava-flows and as intrusive sheets, dykes, and masses. It is the fine-grained equivalent of the coarsely-crystalline syenites. See IGNEOUS ROCKS.

Tractarianism is named from the ninety *Tracts for the Times*, published at Oxford in 1833–41. The principal writers were Pusey (q.v.), Newman (q.v.), Keble (q.v.), Hurrell Froude, and Isaac Williams. See also ENGLAND (CHURCH OF).

Traction-engines are usually steam locomotives dragging trailer wagons behind them on ordinary roads; but the term may be here extended so as to include the steam-carriages for conveying passengers—attempted as early as the end of the 18th century.

Steam-carriages.—It was to the conveyance of passengers by steam that all the plans of early inventors were devoted, but at the present day

interest in them is entirely historical. The main idea in all cases was to fit an engine and boiler to an ordinary carriage or coach. The boiler, usually carried at the back, was of some form possessing strength with little weight, and capable of rapidly raising steam; the engine also, either at the back or under the coach, usually worked a cranked axle, and the main axle carrying the two driving-wheels was driven from this by chain gearing; most of them ran on four wheels, though some had a fifth wheel as a steerer. Cugnot, a Frenchman, made a steam-carriage in 1769; it ran at 2¼ miles per hour, and carried four persons; a capsize in a street in Paris led to the imprisonment of the inventor, and put a stop to further trials. Murdock in 1782, Watt in 1784, Symington in 1786, and others made models, but the first one which actually ran in England was made by Trevithick and Vivian in 1803. This attained a speed of 8 or 9 miles per hour in the streets of London; but want of encouragement and difficulties produced by bad roads compelled Trevithick to turn his inventive faculties into other fields of work. Improvements in the main roads led to a great revival of interest about 1830, and during the years 1827-34 numerous more or less successful steam-carriages were built; one made by Sir Goldsworthy Gurney ran for three months in 1831 with passengers between Cheltenham and Gloucester, while Hancock's steam-omnibuses (carrying 14 to 16 passengers) ran pretty constantly during the years 1833-36 in London, and attained often a speed of 10 or 12 miles per hour; some of his coaches ran long journeys, such as from London to Brighton; he was in fact the most successful of all these inventors. Scott-Russell also constructed and ran in 1834 six steam-coaches between Glasgow and Paisley. However, the great opposition placed in their way by road trustees, and the gradual spread of railways, led to the abandonment of all these schemes. In 1891 Serpollet patented an ingenious and successful steam-carriage with a flattened coil boiler; superheated steam was used, and the engine was very economical. The electrically driven or petrol-engine motor-cars have led to the entire abandonment of steam-carriages for passenger traffic (see MOTOR-CARS).

Traction-engines for heavy loads.—The main difficulty with which builders of these engines have to cope has been the driving-wheels, the tires of which must be able to resist the great wear and tear and violent shocks caused by passing over bad roads or uneven ground, and must at the same time possess considerable adhesive powers, since the resistance to motion even on good macadamised roads is more than eight times as great as it is on rails. Boydell, who made the first successful engine in 1856, used a series of flat segments of rails, so jointed round the circumference of the driver that the engine ran, as it were, on an endless tramway; it was an extraordinarily noisy, clattering, unmechanical contrivance, still it gave great adhesion, and enabled his engines to drag heavy loads over exceptionally soft ground. A little later Bray brought out a wheel with rigid tires, fitted with short strong spikes projecting from the rim (these could be withdrawn when not wanted); this, again, had considerable adhesion, but was very destructive to the roads. R. W. Thomson of Edinburgh, in his so-called 'road-steamers,' adopted flexible india-rubber tires; the driving-wheels were light wrought-iron drums about 15 inches wide, with a flange at the sides; round the drum was stretched an india-rubber band 5 inches thick and 12 inches wide, protected on the outside with a flexible sheath of thin steel plates. This tire had the great advantage that it formed a perfect spring for the engine, and, flattening under the pressure, it gave a broad tread, and so increased enormously the adhesion; on paved roads with a gradient it had much better hauling power than any engine with rigid tires. The objection to the use of such tires is their heavy cost (those of the 'Ravee,' a road-steamer for service in India, cost £241), and the expense of renewals; they were, however, very successful, being employed in Glasgow and other towns hauling heavy castings, boilers, &c., from the workshops to the wharves. All these types and many others are now practically obsolete. The modern engine usually has rigid wheels, the hind or driving-wheels are made of steel tee hoops built up with steel spokes radiating from cast-steel bosses, diagonal steel cross strips being riveted to the outside of the tee hoops; the leading wheels, smaller in diameter, are also made of strong section steel tee rings. The traction-engines now in use run on four wheels, the hind pair being drivers, the front pair steerers; the boiler is of the locomotive or some similar type, working usually at steam pressures varying from about 130 lb. to as much as 200 lb., according as the steam-engine is of the simple or compound type; the engine and attached parts are carried on the top of the boiler, cylinder at forward end, crank-shaft at firebox end. The cylinder valves are usually slide-valves, but in the most recent types piston valves have been adopted both for simple and compound engines. Motion goes from the crank-shaft to the driving-axle through steel spur-wheel reducing gear carried by other shafts. The transmission gear is usually arranged on the four-shaft principle; the gear-wheels are cast-steel with machine-cut teeth when of less than two-inch pitch, the gearing is designed to give road speeds of 2 and 4 miles per hour. A differential compensating bevel gear is usually fitted, one driving-wheel being then loose on its axle; this enables the engine to turn corners without straining the axles. Springs are also now usually fitted, though their use somewhat complicates the method of supporting the gearing between the crank-shaft and driving-wheel axle; these, however, greatly reduce the shocks in passing over bad roads. Most of the engines now made have a winding-drum, which enables steep gradients to be overcome; the engine itself proceeds to the top of the incline, then a steel rope attached to the wagon carrying the load is gradually wound up on the drum, thus hauling up the load. To obtain increased power, the engines sometimes have two cylinders, and are also made compound; a stock of coal is carried in a bunker behind the foot-plate, and water in a tank under it. One of the most serious difficulties in the working of these traction-engines is the problem of securing pure water for feeding the boiler, as it is frequently necessary to depend upon supplies drawn from wayside ponds and streams. With water of an indifferent quality there is the risk that the crown plate of the firebox may become badly scaled, with resultant serious loss in heat transmission from the fire to the water, and local overheating of the crown plate and consequent danger of accident. This trouble has been evercome in the most recent types by the use of corrugated firebox tops, such as those used by Messrs Marshall, Sons & Co., of Gainsborough, in their traction-engines and road-roller boilers. These engines are now most extensively used, and are much cheaper than horse traction; this may be shown by the following information in regard to the hauling powers of two classes of traction-engines. A single cylinder type, using steam-pressure of 150 lb. classed as 5 nominal h.p., weighing when in full working order 9½ tons, can haul 15 tons in trailers on average macadamised roads on level or moderate gradients at 4 miles per hour, and up a gradient of 1 in 12½ at 2 miles per hour. A compound

cylinder type, using steam-pressure of 180 lb., classed as 8 nominal h.p., weighing 13 tons when in full working order, can haul under the above conditions a load of 23 tons. Steam-ploughing by direct traction can be carried out by using engines of very similar design, but fitted with travelling wheels of exceptionally large diameter and width of face. With the use, if necessary, of multi-furrow ploughs (up in some cases to 10 or 11 furrows) direct traction-ploughing, except in swampy or hilly ground, is probably more economical in first cost of plant and in working costs than the cable systems for hauling the ploughs.

Agricultural locomotives are essentially portable engines, fitted with various methods of self-propulsion—in some cases by pitch-chains, more usually by spur-gearing. They are much lighter in make, though otherwise very similar to traction-engines; they are employed mainly in drawing loaded wagons, thrashing-machines, &c., from farm to farm; by disconnecting the propelling gear and blocking the wheels, they can be used as stationary engines to drive by belting off the flywheel, with which they are always fitted, thrashing-machines, fans, and other farm plant. Fowler's steam-ploughs are locomotive; they are able both to pay out and wind up the steel rope moving the plough to and fro, and also to shift themselves along the field. Traction-engines are now made by all the chief firms of agricultural implement-makers; to the late Mr T. Aveling of Rochester, much of the present success of steam road-traction is due. In making macadamised roads, the rolling of the broken metal is now done by heavy steam-propelled rollers very similar in all respects in design to traction-engines.

Tract Society. In the 17th century several traces are found of associations for printing and promoting the sale of religious works, but none of them seems to have existed long. The 'Society for Promoting Christian Knowledge,' founded in 1701, had for one of its objects 'the dispersion, both at home and abroad, of Bibles and tracts of religion.' In 1750 was formed 'The Society for Promoting Religious Knowledge among the Poor,' not, like the former, confined to the Church of England, but embracing Christians of all denominations. The Religious Tract Society (1799) originated with the Rev. George Burder (q.v.). Its beginnings were humble, but it soon expanded. The Society's operations have extended over all quarters of the world, and it has issued books and tracts in some 300 languages and dialects. Its business is conducted by a committee of whom half are members of the Church of England and half Nonconformists. It also carries on important missionary work at home and abroad by grants of money and books. The Tract and Colportage Society of Scotland was instituted in 1793.

Trade, Board of, a department of government more correctly designed 'The Lords of the Committee of Her Majesty's Privy-council appointed for the Consideration of all Matters relating to Trade and Foreign Plantations.' In 1660 Charles II. created two separate councils for Trade and for Foreign Plantations, which in 1672 were consolidated into one. The Board of Trade and Plantations, after being abolished in 1675, and reappointed in 1695, was again abolished in 1782. In 1786 the presently existing department was established by Order in Council, being a permanent committee of Privy-council for the consideration of all matters relating to Trade and the Colonies. The board consists of a president, together with the Lord Chancellor, the Archbishop of Canterbury, the First Lord of the Treasury, the principal Secretaries of State, the Chancellor of the Exchequer, the Speaker of the House of Commons, and others. But of the latter *ex officio* members none take part in the work of the board which is managed by the president and his staff; the staff includes the permanent and parliamentary secretaries, four assistant secretaries, and a chief of the statistical department. Since 1864 the presidentship has usually been held by a cabinet minister. Before 1867 there was a vice-president who was a member of the administration, though without a seat in the cabinet.

The functions of the Board of Trade are partly of a ministerial, partly of a judicial kind, and have of late years been greatly enlarged by a variety of statutes. The board is charged with the general superintendence of all matters relating to the mercantile marine. It requires and considers reports made to its inspectors and other officers, and orders returns of various kinds regarding trade and navigation. It is empowered to make regulations regarding the examination and qualifications of applicants for the position of master or mate of passenger-ships. Under the Merchant Shipping Act, 1854, it grants licences to persons to engage or supply seamen or apprentices for merchant-ships, decides on claims for wages, and investigates charges of misconduct and incompetency. It also appoints officers to inquire into and report on the condition of steam-vessels.

The supervision of railways and railway companies, both as to their original formation and their working, constitutes an important part of the duties of the Board of Trade. Railways were first subjected to government control by an act of 1840 which conferred power on the Board of Trade to appoint inspectors of railways, to approve or disallow bylaws, to require returns of traffic, and to decide disputes between connecting lines. Further powers have been added by subsequent acts. In 1846 the increase of these duties, arising from the rapid extension of railways, led to the transfer of this department of the Board of Trade to a separate board created exclusively for the management of railway business; but in 1851 this latter board was abolished, and its powers were retransferred to the Board of Trade. Notices of applications for railway acts with plans are required to be deposited with the board before any bill can be introduced into parliament; and before any railway can be opened for traffic the permission of the board must be obtained on the report of an inspector. On the occurrence of an accident notice must be given to the board, which sends an inspector to inquire into the circumstances, and on his report the board is empowered to take what steps are judged necessary for the security of the public.

Many matters relating to the interests of trade which come before other departments are referred to the Board of Trade for information or advice. Thus there are frequent communications with the Foreign Office regarding the negotiation and working of commercial treaties, and with the Treasury regarding alterations in the customs. The Board of Trade is also concerned with trade disputes through the Industrial Councils established in 1911, trade boards and unemployment exchanges.

A statistical department of the board was established in 1832, whose province is to collect and publish tables containing classified information regarding the revenues, population, commerce, wealth, and moral and economical condition of the United Kingdom and its dependencies, to prepare a selection from the statistics of foreign countries, and a monthly account of trade and navigation. All applications made to the King in Council by companies or private persons for charters of incorporation are referred to the Board of Trade; and among the functions committed to it by statute are the

registration of joint-stock companies and copyright designs, and the supervision of proceedings under the Bankruptcy Act, 1883. The board is empowered by several local and personal acts to control the proceedings of the commissioners for regulating the employment of coal-whippers and the discharge of coal-laden vessels in the port of London. In 1853 the Department of Science and Art, which owed its origin to suggestions made in the Second Report of the Commissioners for the Exhibition of 1851, and was at first a department of the Committee of the Privy-council on Education, was placed under the control of the Board of Trade; but in February 1856 it was retransferred by an Order in Council to the Education Department. Since 1886 the department issues monthly the valuable *Board of Trade Journal*, containing extracts from consular reports, customs regulations and changes of tariff, a report on the state of the skilled labour market, and much information of value to the mercantile community.

Trade Boards. See TRADE UNIONS (*Conciliation*).

Trade Corporations. See CORPORATION, COMPANY, GUILDS, LIVERY.

Trade Disputes. See MASTER AND SERVANT, TRADE UNIONS (*Legal Position*).

Trade-marks. A trade-mark is the name or mark under which any one trades. It is a mode of connecting certain goods in the mind of the public with a particular manufacturer or seller; and its function is to give to a purchaser a satisfactory assurance of the make and quality of the article he is buying. A trade-mark is the property of the person legally adopting it, and he has a right —antecedent to and independent of the various trade-mark acts—to prevent any one else from using it to his prejudice.

Water-marks on paper, dating from the 14th century, are among the oldest trade-marks. Trade-marks appear to have become a prominent feature in the industrial life of England in the early part of the 18th century. The law relating to them has pursued the following course of development. (1) At first no *right of property* in a trade-mark was recognised, and only the *actual, fraudulent, and injurious* use by one person of the mark of another was restrained and punished. This rule, which originally prevailed both at common law and in equity, was inspired by the old judicial dislike of patent privileges and the failure to see the essential difference between a patent and a trade-mark. (2) In 1838, however, in the case of Millington *v.* Fox (3 My. and Cr. 338) Lord Chancellor Cottenham granted a perpetual injunction against the defendant, although no intentional fraud was established. Since that time the Court of Chancery has uniformly interfered to prevent the infringement of trade-marks on the principle of protecting property alone, and it has not been necessary for the plaintiff to prove that the defendant invaded his rights intentionally. (3) The Courts of Common Law did not imitate the wise liberality of the Court of Chancery, and down to 1873 proof of fraud on the part of an infringer was of the essence of a common-law action for damages. The Judicature Act of 1873 provided, however, that in any conflict between the rules of law and of equity the latter should thenceforth prevail; and if actions of infringement were still tried in the King's Bench Division, there can be little doubt that the equitable rule would be applied, and proof of fraud dispensed with. (4) But under the Judicature Acts and the Rules of the Supreme Court, trade-mark cases are brought in the Chancery division, so that the former variance between the Courts of Common Law and the Court of Chancery has now only a historic interest and importance. The owner of a trade-mark that is being infringed usually applies for an *interlocutory* injunction to restrain the immediate infringement, and at the same time brings an action in which he claims (*a*) a *perpetual* injunction, and (*b*) an account of the profits made by the infringer, or damages in lieu thereof. The fraudulent imitator of a trade-mark may be indicted for false pretences, but not for forgery. See, however, Merchandise Marks (*infra*).

The Registration of Trade-marks.—At common law a trade-mark could be acquired only by actual user; it must have been 'so applied in the market as to indicate to purchasers that the goods to which it was attached were the manufacture of a particular firm.' By the Trade-marks Registration Act, 1875, a Register of Trade-marks was established at the Office of the Commissioner of Patents (now the Patent Office), and it was provided that the registration of a trade-mark should thenceforth be equivalent to public user. This provision was in substance repeated in the Trade-marks Act, 1883, and is reproduced in the Trade-marks Act, 1905, by which, together with certain provisions of the Patents Act, 1907, the Patents and Designs Act, 1914, and the Trade-marks Act, 1919, the registration of trade-marks is now regulated. The registration of a person as proprietor of a trade-mark is *primâ facie*, and after seven years is conclusive, evidence of his right to the exclusive use of the said mark (subject to the provisions of the act); and no person can institute proceedings for infringement unless the mark alleged to be infringed has been registered, or, in the case of marks in use prior to the act of 1875, has been declared by the certificate of the Comptroller-general to be non-registrable. A registrable trade-mark must contain at least one of the following essential particulars: (*a*) a name of a company, individual, or firm represented in a special or particular manner; or (*b*) the signature of the applicant for registration, or his predecessor in business; or (*c*) an invented word or words; or (*d*) a word or words having no reference to the character or quality of the goods, and not being a geographical name; or (*e*) any other distinctive mark. There may be added to any one or more of these 'essential particulars' any letters, words, or figures, or combination thereof. Any disclaimer necessary for the protection of other traders or of the public may be required. Any special and distinctive word or words, letter, figure, or combination thereof used *separately* and as a trade-mark prior to the act of 1875 is still registrable. A trade-mark when registered may be assigned and transmitted, but only in connection with the goodwill of the business concerned in the particular goods or classes of goods for which it has been registered, and is determinable with that goodwill. The provisions for the rectification of the Register noticed in the article PATENTS apply, *mutatis mutandis*, to trade-marks. Where a registered word trade-mark is the only name of an article or substance manufactured under a patent, the right to the exclusive use of such trade-mark ceases on the termination of the patent. The 'International Convention for the Protection of Industrial Property'—the history of which is given in the same article—also extends to trade-marks. The convention has been applied to various colonies and other countries under British jurisdiction and in the chief European states. Under that convention an applicant for registration of a trade-mark in any one of the contracting states may obtain protection in any of the other contracting states by application there within four months from the date of the first application. The subsequent application is ante-dated to the date of the first, and is consequently not

defeated, as otherwise it might have been, by prior user in the protected interval. The rights conferred on a person who has applied for protection of a trade-mark in a foreign state extend to his legal representatives and assignees (Patents and Designs Act, 1914). In Britain in 1923 there were 12,479 applications for registration of trade-marks, and 4837 were registered. In the United States the numbers were 16,817 and 14,845.

Merchandise Marks.—Under the Merchandise Marks Acts, 1887–94, which apply to England, Scotland, and Ireland, every person that (*a*) forges, (*b*) falsely applies to goods, (*c*) makes, disposes of, or has in his possession any instrument for forging any trade-mark, or (*d*) applies any false trade description to goods, is liable, on conviction on indictment, to a maximum period of two years' imprisonment, and on summary conviction to a maximum term of four months' imprisonment with hard labour, or a fine of £20, for the first offence, and in the case of a second or subsequent offence to a term not exceeding six months with hard labour, or a fine of £50. Any person aggrieved by the decision of a court of summary jurisdiction may appeal to quarter sessions. It is a competent defence to a prosecution under the act that the defendant took all reasonable precautions against committing the offence, and gave, on demand by, or on behalf of, the prosecutor, all the information in his power, or otherwise acted innocently. The limitation for proceedings under this act is the expiration of the three years next after the commission, or the one year next after the discovery, of the alleged offence, whichever shall first happen. A conviction under this act does not relieve the defendant from liability to *civil* proceedings. By the Merchandise Marks Act, 1911, important powers are conferred on the Commissioners of Customs of requiring from the importer of goods bearing a fraudulent mark information as to the name and address of the person by whom the goods were consigned to the United Kingdom, and production of documents relating to the goods.

See works by Sebastian and Kerly.

Trade Protection Societies are associations composed of merchants, tradesmen, and others, which have been formed for the promotion of trade and for protecting the individual members from losses in their business transactions; one of the earliest being the 'London Association of Guardians for the Protection of Trade,' established in 1776. In 1871 the Board of Trade granted a license for incorporation to one under the Companies Acts, 1862–67. The operations of these societies used to be confined chiefly to the compilation of registers of bankruptcies, insolvencies, and private settlements with creditors. Each member informed the secretary of the name, occupation, and address of the customers who became insolvent, with the amount of dividend their estate yielded; and latterly, whether the insolvency was due to recklessness and extravagance, or was innocent misfortune. Special attention was directed to the exposure of swindlers and persons who had been guilty of fraud or embezzlement. The information accumulated in the registers, though always accessible to such members as made inquiry at the offices of the society, was kept strictly private from all others. But the extraordinary development of commercial enterprise which took place in the early part of the 19th century added a new stimulus to the trade protection movement. The registers which the societies now printed and circulated among their members contained transcriptions from the following public records—viz. the records of the bankruptcy courts, registers of assignments and trust-deeds, bonds or warrants of attorney, bills of sale, judges' orders, protested bills, and decrees in absence. The societies also undertook to recover past-due bills and accounts for their members, to investigate the circumstances connected with bankruptcies and insolvencies, collect dividends, and perform the general agency business of their members—the whole being done under the direction of a committee appointed for this purpose. Committees were also appointed to scrutinise all measures affecting trade and commerce which might be introduced into parliament, and to promote legislation favourable to the commercial interest. The sphere of action of trade protection societies thus rapidly widened. The older societies established offices and branches throughout the country; new societies sprang up in the large provincial cities, which in their turn opened agencies and branches in other towns and villages; and the various societies being in communication, the machinery of the whole is available for the purposes of each. In 1852 the various societies formed themselves into an association.

Tradescantia, a genus of American perennial herbs (Spiderworts) of the family Commelinaceæ, differing much in habit. Some belong to the United States, and some are tropical. The flowers are loosely or densely panicled, and resemble umbels. *T. virginiana* is often cultivated in gardens. A form of this species, *T. discolor*, has leaves dark-green above, violet below. The genus was named after John Tradescant, traveller and gardener to Charles I., erroneously said to be of Dutch descent, who died in 1637. It was his son and successor, John Tradescant (1608–82), also a traveller, who left his *Museum Tradescantianum* to Elias Ashmole (q.v.).

Trade Unions are combinations of wage-earners maintained for the purpose of protecting the workman in the conflict between the rival interests of labour and capital, and are defined legally in the Trade Union Act of 1876 as 'any combination, whether temporary or permanent, for regulating the relations between workmen and masters, or between workmen and workmen, or between masters and masters, or for imposing restrictive conditions on the conduct of any trade or business.' Their justification is that the individual workman, acting separately, can never have the power necessary to compel unwilling employers to grant concessions, and that only when the workmen combine and act together through representatives can they protect and benefit themselves. Arising historically as a product of capitalism, these protective associations have found their characteristic weapon in the strike and the mass resistance to the lock-out of the masters; in the course of their development, however, a new point of view has emerged, and the trade union has become the organ of industrial democracy.

Early History.—Strictly speaking, the history of trade unionism cannot begin prior to the industrial conditions which created the conflict of which it is a part. These conditions are marked principally by a separation between the employed and employing classes. So long as the journeyman could hope reasonably to become an employer in due time, so long as the employing section was regarded generally as but a group of the whole mass of labouring people, this separation was not complete, and modern trade unionism could not arise. The separation did not come suddenly, and so trade unionism has an interesting introductory history in the evolution of the craft gilds, which, however, in no instance emerged into trade unions. There is some disagreement as to the exact function of the craft gilds and their relation to the

industry of their time (cf. Ashley, *Introduction to Economic History and Theory;* Cunningham, *History of Industry and Commerce;* Brentano, *Guilds and Trade Unions*), but their nearest approach to the modern trade union was the attempt to protect the small employer from being crushed out by the large capitalist. The craft gild was essentially an organisation to protect one type of capitalist producer against another; the trade union is essentially an organisation to protect the hired workman against his hirer. The difference is fundamental.

The early history of trade unionism is concerned with a three-fold process: (1) The evolution of industry, so that group after group of trades comes to offer opportunities for labour organisation; (2) the federating of separate unions in the same group of trades; (3) the adoption of new policies to meet new industrial circumstances. This last includes the emergence of trade unions as a new political power in the state, and has, notably since the beginning of the century, reacted potently on (2), stimulating the formation of amalgamations, and tending to obliterate the old craft lines of demarcation in the interest of a new sense of solidarity among the workers as workers.

(1) The origin of trade unions may be assigned, if not to gilds, to the social habits of the workman. 'People of the same trade seldom meet together,' says Adam Smith in his *Wealth of Nations*, 'even for merriment and diversion, but the conversation ends in a conspiracy against the public or in some contrivance to raise prices.' Thus, we find that the earliest combinations were formed in trades like tailoring and shoemaking, which allowed considerable intercourse amongst the workmen; and the movement towards association developed rapidly with the growth of the factory system. The movement, Mr and Mrs Webb state in their *History of Trades Unionism*, begins in the 18th century, and is marked by petitions and counter-petitions of employers and employees to the House of Commons, and by an increase in the number and stringency of laws against combinations until the Act of 1799 made illegal all combinations for an advancement of wages, a decrease of work, or interference with the management of business. It has also to be noted in passing that the mediæval spirit of Christian charity, especially as regards the dead and the wandering, determined that, from the first, the older societies should give friendly benefits. The Glasgow coopers, with a record going back to 1752, well illustrate the activities of such societies, and it was a frequent complaint that, in the event of disputes with employers, these compassionate funds were spent for fighting purposes. As a purer example of a union formed to meet economic change, that of the tailors may be selected. The growing tendency in the 17th century to wear fine clothes led to a differentiation in skill in cutting and designing from the capacity to sew. It also tended to differentiate the shop-keeper-middleman from the workman. Capital was required for the shops, and skill in designing and cutting-out came to be in a position to employ to its own advantage the mere sewer. Hence we find that in 1720 over 7000 journeymen tailors in the city of London combined to raise wages and reduce their working day by an hour, and to defend themselves against any prosecution which might follow (Galton, *The Tailoring Trade*). Frame-work knitters and compositors were active for similar purposes.

The other cause of combination—the rise of a capitalist class owning the means of production—is illustrated in the unions amongst the woollen workers in the west of England, whose doings were brought before parliament in 1717. This is specially interesting because, as Mr Webb points out, whilst in the west country, where the manufacturers were rich and owned the machinery of production, there were unions at an early date, in Yorkshire, where the industry was domestic, no unions were formed till that system died out towards the end of the 18th century. Similar changes had befallen the hosiery, the cotton, the cutlery trades, each of which shows signs of labour combinations before the factory system proper became the rule. When this system became prevalent towards the end of the 18th century, every trade began to have its unions. Some, like unskilled labouring in all its branches, did not respond, owing to their poverty and the casual nature of their work, till much later; and not till the dock strike of 1889 did the class of dock-workers, gas-labourers, and the like form and maintain a combination.

Even when the economic and industrial conditions have been favourable, the spread of trade unionism has depended very considerably on tides of public feeling, and these tides have been accompanied, as a rule, by legislative changes. Laws limiting the economic power of the workman to improve his condition by forcing up the price of his labour power on the market appeared early on our statute-books, the typical and best known instance being the Statute of Labourers, passed in 1350–51. The petitions to which reference has been made, addressed to parliament by employers throughout the 17th century, led to the passing of the Combination Act of 1799. The theory had been that parliament acting through the justices protected the workman, and statutes had been passed and were enforced fixing wages, the number of apprentices, the amount of machinery to be used, and similar things. But both theory and practice were breaking down; and when the workmen began to protect themselves by combinations, parliament resented it, and the interest of employers then controlled the legislature. Consequently, during the whole of the 18th century, acts were being passed prohibiting combinations in specified trades. The Act of 1799 was general, and was hustled through parliament. There had also been growing up through the century a code of master and servant, and conspiracy laws. Although these acts failed to stamp out combinations they led to many prosecutions—as many as 1100 per annum on the average, according to Mr Howell (*Labour Legislation, &c.*)—and by the end of the first decade of the 19th century a somewhat conflicting agitation for legislative revision was on foot. Employers desired the repeal of some of the acts, and workmen the repeal of others. In 1824 a select committee of the House of Commons was appointed to inquire into the operation of the Combination Laws, with the result that in that year they were repealed. A great increase in trade union activity was the immediate response. People became alarmed, and a further inquiry was immediately undertaken. It was shown that the unions had increased greatly. Prices were rising, and men had the greatest incentive to combine. The law was again altered in 1825 to the disadvantage of the workmen, but the right of combination was recognised Amongst the unions founded in this period, and still surviving, are the Consolidated Bookbinders (1792), the Friendly Society of Ironfounders (1809), General Union of Carpenters and Joiners (1827), with names changed after absorbing or amalgamating with other societies.

(2) A new period dates from about 1833. When the Combination Laws were altered the idea of national unions began to be discussed. Many trade clubs and local societies were in existence, and proposals were made for their union. In 1829

the trade clubs of the cotton-spinners became branches of a national society. Indeed the idea of one society for all trades was then mooted, and several attempts were made to carry it out (1830–4). But the time for that had not then come. For the next forty years the characteristic of trade union evolution was this federating of local bodies into national amalgamations. Through periods of much unsettlement and strife, of stagnation and activity, the great national unions, pioneered by those of the cotton and building trades, grew, tossed about every now and then upon political and utopian waters, as in the heyday of the Owenite and Chartist agitations, but always increasing in membership and solidarity. Amongst the societies which date from this time are the Amalgamated Society of Engineers (1851)—now the Amalgamated Engineering Union—the amalgamation which typifies the whole period; the Operative Bricklayers' Society (1848); the Yorkshire Miners' Association (1858); and the conflicts which marked the triumph of the workmen include the historical lock-out in the engineering trade of 1852, the Preston cotton strike of 1853, the strike and lock-out in the London building trade of 1859–60.

The period began with a revolutionary spirit, Owenism, and ended with the vision of the unions narrowed to conflicts with the employers upon specific points. The increase of political liberty, and the enjoyment on the part of the workmen of some measure of economic improvement, had an influence on trade union policy. The support of middle class and professional men led the unions to appeal to the law courts and parliament, and definitely to adopt the strike as a method of redressing specific grievances. This change took place about the middle of the period (1840–50). In these years also the beginning of the trade union 'civil service' of specialised secretaries and administrators is to be found.

The Amalgamated Society of Engineers set aside in its rules the secrecy with which unions were wont to conduct their business. But the old spirit of secret conspiracy engendered by unwise legislation died hard, and it produced as a final legacy what are known as the 'Sheffield outrages.' Another inquiry into the combinations of workmen was demanded. The unions were not adverse, for not only were they certain that the 'outrages' would be found to have no essential connection with trade unionism, but they believed they could prove to the commission that labour combinations ought to be granted wider legal freedom. A Royal Commission on Trade Unions was appointed (1867), and its report issued two years later was a virtual exoneration of the unions. The extension of the franchise, which took place in 1868, enormously strengthened the power of trade unionists, and the Trade Union Act of 1871 followed. Trade unions were legally recognised, workmen were allowed to combine to withhold labour, peaceful picketing was admitted, and the law courts were not to interfere in the internal government of unions. Trade unions were thus put on a legal footing all by themselves.

(3) Hitherto the organised trades had been almost exclusively skilled trades. From time to time attempts had been made to organise the labourers, but such unions had been ephemeral. The activities of Socialist speakers in the east end of London from 1882 onwards created the conditions under which the famous dock strike of 1889 was a success, and unions of unskilled labour followed. A change in trade union policy, known as 'the New Unionism,' then came as a consequence. In the first place the labourers' unions did not attempt to copy friendly societies. They asked for very small contributions from their members, and they spent their money in organisation and in fighting. But that was only an indication of a more fundamental change. The 'new unionism' came near to the unionism inspired by Owen and the Chartists. It sought industrial change through parliamentary action. Superficially, this was no new departure, for, in ways appropriate to the opportunity which the times presented, labour combinations have always been ready to turn to parliament for assistance, and the 'old unionists' had not only carried on an active propaganda in the lobbies of the House of Commons (Howell, *Labour Legislation, Labour Movements, and Labour Leaders*), but had run candidates, through the Labour Representation Association, for parliament, first of all at a bye-election in 1869, when George Odger was their champion, and at the General Election of 1872, when Mr Alexander Macdonald and Mr Burt were elected. The difference between the two schools was, however, that whilst the old pursued parliamentary action only to redress certain legal injustices, like the Master and Servant Act, the new regarded parliament as an instrument by which capitalism was to be curbed in its industrial activities and finally supplanted altogether. Politics was to be the ally of trade unionism in the conflict which trade unionism was waging.

Since 1868 the trade unions had met in annual congress, and had an executive body since 1869, known until 1920 as the Parliamentary Committee, and thereafter as the General Council. Year after year the active spirits in the movement brought up at these annual conferences the question of political action. At first the Parliamentary Committee resisted the new trend; but at last, at the congress which met at Plymouth in 1899, the whole movement declared for it on the ground that economic and industrial evolution, as evidenced, for instance, in the concentration of capital and the over-representation of the employing classes in parliament, made it no longer possible for trade unions to fight successfully on the old lines, i.e. by the strike alone.

Modern Trade Unionism: 1899.—1899 is a crucial date in trade union history. The decision to co-operate with the Socialist bodies in forming an independent political party for Labour, meant not only the victory of the new unionism over the old, but the emergence of trade unionism itself in its modern and characteristically British form. It has gone through various moods since then under the influence of changing circumstances and experiences, e.g. the growth of more effective combination among employers, the discovery and application of new sources of economic power, and above all, the Great War with its legacies of interrupted flow in international exchange, disturbed markets, wage cutting, on the one hand, and the development of financial power and industrial combination on the other. It has not worked out either a final form for itself or a completed philosophy. But the direction of its outlook was given by the Plymouth Congress in 1899, and its subsequent history is in essence the history of the infiltration of the implications of that decision right through the body of the membership. The control of human freedom by industrial power, which the industrial revolution really meant, was soon felt by the workers, who found themselves, their status, and conditions completely subject to that power. Their first effort at resistance—overlooking sporadic disorders—was to organise themselves into unions which, accepting the system, asked for higher wages, shorter hours, steadier employment, pensions, &c., within it, but by the end of last century, they had begun to extend and deepen their vision and see their

task in a wider relation than had hitherto been possible. Labour began to survey the whole battle-front, the far objective, and not only the limited point of immediate attack. It then realised that the industrial organisations of the workers engaged in defensive operations against capitalism were but an incident in the long-drawn-out conflict between the human spirit striving for freedom and material circumstances imprisoning that spirit. It was fighting a battle wider than that of workshop grievances. So, when trade unionism in 1899 swung itself into politics, it announced not only a change in tactics, but in mind. It ceased to be merely a defence force, it became an active agency in reconstructing society; at the same time it continued to carry on its wonted industrial work.

History since 1899.—The victory of the new unionism in 1899 was consolidated by a series of amalgamations that went on continuously during the next twenty years and are still going on. In 1888, the Miners' Federation of Great Britain had been founded, but it was not until ten years later, when the Durham and Northumberland miners joined it, that the federation could speak for the whole body of workers in the coal industry. In 1910 the Transport Workers' Federation was formed, to be extended some ten years later. In 1913 the National Union of Railwaymen launched an 'all grades' programme, based on the idea that all classes of workmen engaged in an industry like railways should be in one union and not in separate unions of their respective crafts. The outstanding feature in the trade union world of to-day is the unions that represent this 'all grades' policy and stand for the claims and aspiration of workers as such, against the craft spirit of the older unions. The idea of national sympathetic union action grew, and French revolutionary syndicalism and its American counterpart, the Industrial Workers of the World, influenced the movement. This culminated in 1926 in the general sympathetic strike undertaken to help the miners (*infra*).

The foundation in 1899 of the General Federation of Trade Unions was intended to give expression to this new idea of mutual support and protection. The federation, which was an insurance agency with a common fund, was to provide resources for unions engaged in disputes, and help financially weak unions to fight their battles. The federation has since dwindled in importance, and can now claim but 600,000 members.

The years that followed were agitated and unsettled, and unemployment was a constant irritant. In 1910, 1911, and 1912 a series of great strikes took place, of which the outstanding ones were the railway struggle of 1911 and the mining dispute of 1912, which ended in the settlement of a national minimum wage by legislation. This led to some conflict of opinion between revolutionary industrial action, 'direct action,' and constitutional political and trade union action, the Socialist influence being strongly in favour of traditional trade unionism combined with parliamentary activities. The whole trade union world was still in a condition of unrest when the war broke out. An industrial truce was, thereupon, at once proclaimed, and the unions surrendered certain privileges in view of the national needs. Upon peace there was much unsettlement. The government during the war had pledged itself to restore trade union conditions after the conclusion of peace, and there were difficulties in doing this. Extravagant promises of great change could not be kept. Many hoped, however, that after the war a new era of peaceful reconstruction was to begin, and hopes for industrial conciliation were based upon the 'Whitley' Councils (1917), on which representatives of employers and workers sat.

The first big task that had to be faced was the decontrol of services that had practically to be nationalised for war purposes. Decontrol of the railways was followed by the great railway strike of 1919, ending in the establishment of a national sliding-scale system in 1921; the sudden decision to decontrol the mines, following on the refusal of the government to carry out the finding of the Royal Commission (Sankey) they had set up in 1919, led to a protracted and disastrous lockout. The commission did secure a seven hours' day for the miners, but its recommendations as to nationalisation were disregarded. From then till now the history of trade unionism has been the history of the miners. Since 1921 unrest has been constant in the mining industry, where conditions were going from bad to worse. The threat of united trade union action in support of the miners failed in 1921 with the collapse of the triple alliance which had been effected for mutual protection between the railway and transport unions and the miners; but in July 1925 it compelled the government to grant a subsidy to the industry (£23,000,000) and appoint the Samuel Commission. All attempts to settle the dispute failed and work on the coal-fields ceased on the 1st May (1926). A conference of trade union executives decided that day to declare a national strike in support of the miners to begin on the night of the 3rd. This lasted till the 11th, when the General Council produced terms on which it believed a settlement would be made. Upon their rejection by the miners the council called off the national strike, and the miners continued their struggle until the 20th November, when they surrendered. Meantime, the government had passed the Miners' Eight Hours Act, and work was resumed on district settlements, reduced wages, and lengthened hours. The Trade Union Act (1927) followed (*infra*).

Disputes.—Statistics issued by the Ministry of Labour show that between 1910 and 1925, including both years, over 280,000,000 working days were lost through industrial disputes.

Year.	No. of Work-people Involved.	No. of Days Lost.
1910	514,000	9,867,000
1911	952,000	10,155,000
1912	1,462,000	40,890,000
1913	664,000	9,804,000
1914	447,000	9,878,000
1915	448,000	2,953,000
1916	276,000	2,446,000
1917	872,000	5,647,000
1918	1,116,000	5,875,000
1919	2,591,000	34,969,000
1920	1,932,000	26,568,000
1921	1,801,000	85,872,000
1922	552,000	19,850,000
1923	405,000	10,672,000
1924	613,000	8,472,000
1925	442,000	7,966,000

Far the most expensive years, from this point of view of lost time, were thus 1912, and the years of the post-war slump—1919–23; 1912, 1920, and 1921 include great mining stoppages; 1921 being, like 1926, a lock-out. Out of the total of days lost, the post-war slump years account for 170 million, or far more than half.

From time to time the chief points of conflict between capital and labour have changed, and at no time have they been the same in every trade. Trade union programmes have, therefore, varied very greatly. Nearly every union has had to fight for what is called 'recognition,' by which is meant the right of the representatives of the organised workmen to negotiate with the employers in the name of the workmen. This was involved in the famous Preston cotton strike of 1853. Now this long drawn out battle has been won, and recognition is universally granted. The limitation in the number of apprentices—long the subject of statutory

enactment (1566 and 1603)—was the cause of contention from the beginning of labour combinations. When machinery became common the old system of apprenticeship began to decay, and the skilled workman saw his market flooded by men who had not been trained in their calling. The workmen tried to enforce the Statute of Apprentices against their employers, but without success, Lord Ellenborough declaring (1811) that new trades like engineering did not come under it. From 1812 till 1814, when parliament abolished a statutory limitation upon apprentices (a Parliamentary Committee of Inquiry was appointed in 1813), an agitation was carried on by petition, pamphlet, and correspondence by the threatened journeymen, and later on the collective power of trade unionism was used to force employers to impose restrictions upon themselves. During the middle years of the 19th century this was a much discussed matter, such societies as the engineers, the boot and shoe operatives, the compositors, the flint glassmakers (which declared a strike in 1858–59 on the question) being specially agitated by it.

The use of machinery was another sore point with the unions. The workman who finds a machine turning him out on to the street is not pacified by the thought that it is reducing the cost of production and giving an impetus to labour of another kind to his own. Therefore, Luddism appears with what is called the 'Industrial Revolution.' The strike in the boot and shoe trade which dragged on between 1857 and 1859 arose from the introduction of a machine for 'closing' the uppers of boots.

But the common causes of disputes have been on questions of hours and wages. The historical 'nine hours' strike and lock-out in the building trades (1859–62), and in the engineering trades in the north-east coast (1871), bear their purpose on their title, and the disastrous engineers' dispute of 1897 was for an eight hours' day. At the same time, strikes for reductions in hours, if severe, have been few. During the ten years from 1900 to 1909 inclusive, whilst there were 3028 strikes on wages' questions, there were only 169 on questions relating to hours of labour. The advantages of shorter hours have been gained largely as an indirect result of factory legislation affecting women and children, though the Mines Act of 1908 directly dealt with adult men. But the pressure and other influences of trade unionism have been effective in an unobtrusive way in reducing the length of the working day. Strikes for reductions in hours have as a whole been less successful than strikes for increases in wages. The reasons appear to be: (1) That increases in wages are seldom asked for unless the state of the market can evidently bear them; and (2) To shorten working hours is a complicated industrial change not only affecting profits, but also workshop management with results difficult to foresee.

Some years ago the agitation for a legal eight hours' day was very popular, especially amongst the more Socialistic trade unionists. It was largely a product of the 'new unionism' which arose after the dock strike (1889), and a good deal of literature appeared on the subject. This is also a plank of the international labour platform, but for some years little interest has been taken in it, though frequent attempts have been made to revive it. The miners were successful in getting their Eight Hours Bill carried in 1908 after an agitation of twenty years, and in 1919 seven hours became the legal maximum working day, again to be lengthened to eight in 1926. The International Labour Convention, summoned to meet at Washington by the League of Nations in 1919, passed by 83 votes to 2 an international eight hours' agreement, which somewhat revived the agitation, but none of the great industrial powers, save Belgium, have seen fit to ratify it (1927).

The most fruitful of all the causes of labour disputes have been matters affecting wages—either demands for increases or refusals to accept reductions. This has been a particularly prolific cause of disputes in the cotton and mining trades.

The following summary of the causes of disputes is taken from official sources:

	Wages.	Hours.	Trade Unionism.
1908	249	14	29
1909	256	27	31
1910	302	22	41
1923	353	16	91
1924	436	13	57
1925	306	15	72

An important part of the disputes regarding wages has been the basis of pay—e.g. piecework, time-rates, bonuses; and it has been found that whilst one trade favours one method, another favours another. The commonly-held belief that trade unions are opposed to piecework is nothing but a delusion. The attitude of the unions is determined by the circumstances of each trade, but agreements on a basis of 'piece' or a statement of prices—as, for instance, in the boot and shoe trade—are as common as, if indeed not more common than, agreements on a basis of time—as, for instance, the docker's 'tanner' an hour. What the unions try to secure is a piece-rate which to the average workman will secure a weekly income upon which he can live; or, as it was expressed in connection with the sliding-scale arrangements by which wages rise and fall with the market-prices of products, 'a scale with a living-minimum, below which it cannot slide.'

Although the history of the trade union movement from 1899 is marked by renewed industrial conflict, these incidents stand out in any chronicle with undeserved prominence against the quieter background of industrial bargaining through which the unions used their power to maintain or improve conditions for their members, and, very slowly, win for the workers a new status. Disputes never have been the whole of trade union history, least of all in its modern phase. It is significant that in 1924, according to the returns of the Registrar-General, registered trade unions spent only £1,151,137 on dispute benefit, against £3,175,709 on unemployment, travelling, and emigration benefit; £818,598 on sick and accident benefit, £306,922 on funeral benefit, and £984,108 on 'other benefits,' including superannuation, &c., i.e. less than a fifth of their expenditure on benefits was on dispute benefit.

Of the disputes and lockouts that took place in 1925 50·7 % arose out of wages questions, 2·5 % out of questions of hours, 23·3 % out of 'employment of particular classes or persons,' i.e. demarcation. In the same year 26 % of disputes were settled in favour of workpeople, 31 % in favour of employers, and 42·8 % were compromised. This latter table, however, requires to be read in connection with the fact that the disputes settled in favour of the workpeople affected 56·9 % of the workpeople; those settled against them only 15·5 %.

Conciliation.—The Conciliation Act of 1896 gave the Board of Trade power, since transferred to the Ministry of Labour, to intervene in any dispute if both parties agreed; since 1908 standing panels of independent persons have been constituted, from which courts of arbitration may be set up. In 1911 an industrial council was established—a joint body, designed to facilitate conciliation. In 1909 the Trade Boards Act set up boards empowered to fix minimum scales of wages in 'sweated' industries. In 1924 a Minimum Wage Act was passed

for agricultural labourers, and local committees were set up to fix it.

The joint industrial councils, devised as the result of the work of the Whitley Committee, presuppose the existence of organisations of workers and employers, on whose basis joint machinery for discussion and the elimination of disputes was to be erected. Such machinery already existed in many of the more highly organised trades—for instance, the engineers have an elaborately devised system by which any matter of dispute which cannot be settled locally is passed on through a series of more comprehensive bodies till it reaches a full national delegate meeting; and similar arrangements for settling issues by mutual discussion exist in the iron and steel, coal-mining, cotton, shipbuilding trades, &c., while for the railways a special representative national council was set up as part of the 1919 settlement. Industrial councils of the 'Whitley' type were either set up or, as in the case of the boot and shoe and pottery trades, superimposed upon existing arrangements. In 1922 there were 73 such joint industrial councils; by 1925 the number had fallen to 43, covering industries employing over three million persons. In addition to this some one and a half million workers are covered by 35 trade boards. During 1925, 423 disputes were settled by representatives of the parties concerned, 44 by conciliation, and 10 by arbitration.

Legal Position of Trade Unions.—The vital significance of political action was brought home to the trade unions by the decision given in the House of Lords (upsetting that given by the Court of Appeal) in the Taff Vale case in 1901. The acts of 1871 and 1876, while denying to trade unions the full privileges of incorporation, had protected them; this decision, however, imposed on every trade union, whether registered or not, complete corporate liability for any injury or damage caused by any person who could be deemed to be acting as the agent of the union, not merely in respect of any criminal offence which he might have committed, but also in respect of any act not contravening the criminal law, which the judges might hold to have been actionable. The Amalgamated Society of Railway Servants had not authorised the Taff Vale strike; nevertheless, damages of over £23,000 were awarded against it. The whole position of the unions was thus challenged. After considerable agitation, during which it was generally admitted that something had to be done, in 1906 the Liberal government passed the Trade Disputes Act, which restored the 1876 position with all its anomalies.

In 1909 a new attack developed. Osborne, a member of the A.S.R.S., took action to restrain his union from spending any of its funds on political objects. In 1909 (the Osborne Judgment) the law courts sustained his claim and gave a new interpretation to the act of 1876. Again agitation followed, and in 1913 another Liberal government passed an act which gave power to a trade union to include in its constitution any lawful purpose whatever, so long as its principal objects were those of a trade union as defined in the 1876 act. Levies for a political fund were to be optional, and that fund was to be kept separate from other monies. Since 1913 this act, with the Trade Disputes Act of 1906 as interpretive of the act of 1876, has defined the legal status of trade unions. The manner in which trade unions make their political levies, and the difficulty of applying the law of peaceful picketing had become a matter of party controversy by 1925, and the general strike in support of the miners in 1926 forced it to the forefront. On the assumption that the general strike had as an object the overthrow of the government, an Act was passed in 1927 making strikes and lock-outs illegal if not confined to trade disputes, or if they have political objects, preventing unions penalising members who do not take part in illegal strikes, limiting picketing and changing the position of the parliamentary levy, so that instead of those unionists who do not wish to subscribe being granted exemption, those who do wish to subscribe must do so by signing a form to that effect. The new Act also prevents unions of civil servants being associated with other trade unions or political parties, and no local or public authority may make membership of a trade union a condition of employment.

Membership.—The movement of trade union membership since 1892 is shown in the annexed table. Of the total for 1924 of 5½ millions, nearly

NUMBER AND TOTAL MEMBERSHIP OF TRADE UNIONS IN GREAT BRITAIN AND NORTHERN IRELAND, 1892–1924.

[Compiled from Returns collected by the Chief Registrar of Friendly Societies, the Registrar of Friendly Societies for Northern Ireland, and the Ministry of Labour. The figures include the *total* membership of all Unions with head offices in Great Britain or Northern Ireland.]

Year.	Number at end of Year.	Membership at end of Year.		
		Males.*	Females.*	Total.
1892	1233	Not available	Not available	1,576,020
1893	1279			1,559,113
1894	1314			1,529,562
1895	1340			1,503,797
1896	1358	1,466,223	142,116	1,608,339
1897	1353	1,583,408	147,209	1,730,617
1898	1326	1,607,973	143,901	1,751,874
1899	1325	1,760,869	150,278	1,911,147
1900	1323	1,868,504	153,757	2,022,261
1901	1322	1,872,783	151,877	2,024,660
1902	1297	1,857,066	155,799	2,012,865
1903	1285	1,837,534	156,055	1,993,589
1904	1256	1,801,550	165,325	1,966,875
1905	1244	1,817 759	179,612	1,997,371
1906	1282	1,999,414	210,844	2,210,258
1907	1283	2,262,522	250,040	2,512,562
1908	1268	2,229,791	255,389	2,485,180
1909	1260	2,214,452	262,773	2,477,225
1910	1269	2,287 303	277,783	2,565,086
1911	1290	2,804,014	334,878	3,138,892
1912	1252	3,026,605	389,771	3,416,376
1913	1269	3,701,693	433,041	4,134,734
1914	1260	3,708,474	436,679	4,145,153
1915	1229	3,867,496	491,075	4,358,571
1916	1225	4,018,043	625,508	4,643,551
1917	1241	4,620,872	877,864	5,498,736
1918	1264	5,323,980	1,209,278	6,533,258
1919	1360	6,600,674	1,325,683	7,926,357
1920	1364	6,994,078	1,340,284	8,334,362
1921	1251	5,617,316	1,004,377	6,621,693
1922	1203	4,743,400	870,343	5,613,743
1923	1161	4,597,061	813,113	5,410,174
1924†	1155†	4,719,823†	811,320†	5,531,143†

* The subdivision of the total membership into male and female is not exact, as estimates have been made for some trade unions which are unable to state precisely the numbers of males and females comprised within their membership.

† The figures given for 1924 are provisional.

Note.—The statistics relate to all organisations of employees—including those of salaried and professional workers, as well as those of manual wage-earners—which are known to include among their functions that of negotiating with employers with the object of regulating the conditions of employment of their members. The figures of membership include members in the Irish Free State and other overseas branches numbering approximately 61,000 in 1924.

one million were accounted for by mining, 678,000 by metal-work, 609,000 by textiles, 334,000 by building, 425,000 by transport other than railways or shipping, 506,000 by railways, 511,000 by general labour. Out of the 5½ millions, again, 4,719,000 were males; the only big group of female workers in trade unions being the textile, which accounted for 334,863 out of a total of 811,320. During the decade immediately preceding the war, trade union membership rather more than doubled. Individual years show upward and downward fluctuations, but, broadly, the total rose from two millions in 1904 to over four millions in 1913. During and

immediately after the war the increase was still more rapid, the membership more than doubling between 1914 and 1920—the 'peak' year—when the total reached 8½ millions. Since then there has been a considerable decline. A large proportion of war-time employees (especially women) drifted out of industry, which they only entered for war purposes; protracted unemployment and falling wages have compelled many others to fall out of membership. The disputes of 1926 were immediately followed by a further reduction in membership.

Comparable figures showing the development of effective association among employers are not available. It is matter of common knowledge that such combination has gone on very rapidly in recent years, and notably since the war. The Annual Abstract of Labour Statistics for 1926 shows that the number of employers' associations 'concerned with labour matters' rose from 1487 in 1914 to 2403 in 1925; but this total by no means comprises all the effective associations of employers organised for industrial bargaining, and takes no account of the progress of industrial amalgamations and trusts.

Trade Union Structure and Government.—Since 1890 there has been comparatively little change in the internal structure of the unions, as described in Mr and Mrs Webb's *History of Trade Unionism*, or Mr G. D. H. Cole's *Introduction to Trade Unionism*. The organisation, having grown up in response to the varying circumstances and conditions affecting the various industries, shows a wide range of difference, and reflects those circumstances and conditions, rather than any consciously adopted principle. Even the two main lines of union organisation which may at present be said to be contending for supremacy, craft unionism and industrial unionism, seldom appear in pure form. At the same time the conflict between these two ideas accounts for a certain proportion of disputes—e.g. those raging round questions of demarcation—and for a good deal of friction between unions. Post-war conditions have exposed the members of 'craft' unions, like the engineers, to exceptional hardships, and encouraged the growth, at their expense, of more or less unskilled and of 'mixed' unions, sometimes on an industrial basis, more often not. These same conditions have caused a merging of small unions of female membership in the related unions of men. Thus the Federation of Women Workers, founded by Miss Mary Macarthur, was in 1921 incorporated as an autonomous 'district' in the National Union of Municipal and General Workers.

The government of the unions is democratic whether one has in mind a small union, consisting of a single local branch, or of a great and complex federation. The election of secretaries in nearly every case, as of executives, is by a ballot vote of the members. In the cotton trade, owing to the high technical duties to be performed, some of the secretaries are chosen by examination; the Iron and Steel Trades Confederation affords a unique example of the selection of secretaries by the executive. Moreover, the rules of the societies provide for the reference of every question of importance to the general body of members. Only in a few cases, as, for example, that of the National Union of Railwaymen, has the executive the power to declare a strike; the normal procedure is for a ballot vote to be taken. So limited is the power of the executive of the Miners' Federation that it is merely an administrative body, the real executive being the National Conference. There is considerable variety of method within the general system—control of funds by branches, district autonomy, appeals from executive decisions, complicated plans for the reference of disputes from one area of discussion to another—but these points are clearly laid down in the rules in every case, and the rules themselves can only be altered by processes which sometimes involve a referendum and always necessitate delegate meetings. Some of the unions have annual delegate conferences; others meetings at stated intervals. Except on great national issues, such as the calling or settling of a strike, ballot votes are generally small, corresponding to the small proportion of members who take a detailed interest in the work of the unions.

The government of the unions is autonomous. No progress has recently been made with the ambitious plans which have been under discussion since the failure of the 'triple alliance' in 1921, for concentrating control in the hands of the General Council of the Trade Union Congress. This was done as an emergency measure during the national strike (1926), but the miners broke away (*supra*).

The General Council has a headquarters staff of its own; but while co-ordinating, it does not in any sense control the individual unions beyond exercising the right to refuse affiliation to unions that break its rules.

Finance.—The income of the trade unions is drawn from the subscriptions of their members. These subscriptions vary widely in amount from union to union, and are determined by whether the wages of the members are high or low, steady or unsteady, and whether the union is solely a fighting organisation or a friendly society as well. Thus, in the general labour unions, where the members are normally in receipt of low wages, the contribution is usually 3d. or 4d. a week, the rates for women being sometimes lower still. Contributions, again, are low in unions like those of the postmen and railwaymen, where employment is steady, and carries certain insurances with it; and in the mining unions which pay few friendly benefits. The skilled craft unionist, on the other hand, pays 1s. a week, or more, which includes several insurances. In many cases levies for specific purposes (political and other) are additional to the normal contribution. In trade union administration friendly benefit funds have never been kept separate from general funds, and have been available for urgent calls for money. The expenditure of unions must be studied with these facts in view, some unions levying themselves to meet administrative expenses alone, others including friendly society benefits in their dues.

The following figures show the income of expenditure of one hundred of the most important trade unions:

INCOME.

	Members' Subscriptions.	Government Grants for Unemploymen	Total.
	£	£	£
1921	10,386,000	7,822,000	19,350,000
1922	8,059,000	5,040,000	13,842,000
1923	7,345,000	2,427,000	10,314,000
1924	7,581,000	1,913,000	10,025,000

EXPENDITURE.

	Unemployment Benefit.	Dispute Pay.	Friendly Benefit.	Management and other Expenses.	Total.
	£	£	£	£	£
1921	14,925,000	3,130,000	1,911,000	3,830,000	24,541,000
1922	7,701,000	1,409,000	1,852,000	3,221,000	14,819,000
1923	3,506,000	675,000	1,786,000	2,787,000	9,404,000
1924	2,927,000	1,149,000	1,896,000	2,828,000	9,406,000

It should be noted that management is a very miscellaneous heading, and includes all unclassed payments, but excludes those made from the Parliamentary Fund.

International Trade Unionism.—Both on its industrial and on its political side organised labour in Great Britain is in close contact with organised labour throughout the world. The war broke the international organisations of labour, but not its

international spirit, and so soon as the armistice made it possible the old affiliations were revived.

On the industrial side contact is maintained partly through the International Federation of Trade Unions, with headquarters at Amsterdam, which is itself a federation of national federations; partly through international federations of the unions in many of the great industries, such as mining, building, clothing, textiles, postal workers.

Generally speaking, continental trade unions did not achieve an effective organisation until after more or less solid Socialist parties had been formed in the various countries. By 1901, however, at a conference held at Copenhagen, it was possible to form an international trade union secretariat which held biennial conferences, and in 1913 was transformed into the International Federation of Trade Unions, generally known as the I.F.T.U. In 1919 the I.F.T.U., which had ceased to function during the war, was reconstructed, with an executive including representatives of the national federated trade unions of all the great countries, save Russia (which set up an opposition 'Red' Trade Union International of its own, on Communist lines, joined by some of the dissident national sections) and the United States, where the American Federation of Labour still holds aloof.

The work of the I.F.T.U. is mainly propagandist, directed to such issues as the eight hours' day, international control of raw materials, working-class education, disarmament, and the prevention of war. It also organises industrial and financial support to national unions engaged in struggles in which international interests are involved—e.g. the recent mining dispute, when it considered (and rejected) an embargo on the transport of coal into England and collected relief funds. Its activities in no way trench on the autonomy of the separate national movements. In 1925 it comprised national federations covering a trade union membership of over 15 millions, out of a total estimated world trade union membership of 36 millions in that year.

Of the national federations constituting the I.F.T.U. the most important numerically is the German, representing in 1925 over 5 million trade unionists as against 4 million for our Trade Union Congress. This 5 million comprised 4½ millions organised in the German Confederation of Trade Unions (*Allgemeiner Deutscher Gewerkscha,tsbund*) and some half a million in the 'Christian' unions, which are nominally non-party. Trade unionism in *Germany* dates from 1868, the year in which our own Trade Union Congress first met; the earliest unions there were founded by followers of Lassalle, and came into a national confederation in 1890. The Christian unions were founded in opposition to the social democratic unions, and only came into being in 1894.

Trade unionism in *Austria* has suffered markedly from Nationalist divisions in the past, and still suffers from division between Socialists and Catholics; there, as in Germany, the Socialist unions comprise the overwhelming majority of organised workers; their membership affiliated with the I.F.T.U. totalled in 1925 over 800,000.

In *France* the trade union movement, like the political, has been kept weak by syndicalism and communism; the Confédération Générale du Travail has never recovered its pre-war strength. It is affiliated to the I.F.T.U. on a basis of only three-quarters of a million members. Trade unionism in France has never emerged from a utopian revolutionary spirit.

The other more important constituent bodies of the I.F.T.U. are the trade union federations of *Belgium* (578,000 members), *Denmark* (230,000); *Holland* (180,000), *Poland* (300,000), *Sweden* (360,000), *Canada* (106,000). In *Italy* trade unionism as we know it has been stamped out for the present under the Fascist régime.

To give any detailed account of the development of trade unionism, either on the continent of Europe, in the British colonies and dominions, or in the United States, is obviously impossible within the confines of this article. In *Australia* trade unionism is powerfully developed, originally on purely British lines, latterly with developments of its own, as the result of specific Australian legislation on arbitration, wages boards, &c. At the end of 1924 the trade union membership there was 730,000, or 55 % of the male workers in the country. In *South Africa* there is a growing trade union movement, of a craft type, among whites; in *India* the development of trade unions is going on, despite extreme difficulties. In *Canada* the trade union movement is closely associated with that of the United States, although the Canadian unions are affiliated to the I.F.T.U. and the American Federation of Labour is not. With 2,800,000 members in 1925, the American Federation of Labour still holds aloof from political action, though it takes a subordinate part at presidential elections. It does not include some of the most powerful and progressive unions in the States, notably the Railroad Brotherhoods and the Amalgamated Clothing Workers. It has to contend with the 'open shop' policy of many big industries and the fact that over a million workers are organised in 'company' unions. Other bodies, such as the Knights of Labour and the Industrial Workers of the World, have now shrunk to small dimensions.

Trade-winds. See WINDS.

Tradition. See ROMAN CATHOLIC CHURCH, NEWMAN.

Traducianism. See PRE-EXISTENCE.

Trafalgar', CAPE, a low promontory on the south coast of Spain, about 29 miles west-north-west of Tarifa (q.v.), on the Straits of Gibraltar. It is memorable for the great naval victory obtained (21st October 1805) by the British fleet under Nelson over the combined fleets of France and Spain under the French admiral Villeneuve and two Spanish admirals. See NELSON; Sir J. K. Laughton's *Story of Trafalgar* (1890), and Corbett's *Campaign of Trafalgar* (1910).

Tragacanth (Gr. 'goat-thorn'), a name given to several low spiny shrubs of the genus Astragalus (*A. gummifer*, *A. microcephalus*, &c.), found in western Asia, and to the mucilaginous substance or gum derived from them—for which see GUM.

Tragedy. See DRAMA, THEATRE.

Tragopan (*Ceriornis*), a genus of birds in the Pheasant family, represented by five species in

Tragopan, or Horned Pheasant (*Ceriornis satyra*).

India and China. They are birds of very beautiful plumage, of the most brilliant reds, browns, buffs, and lustrous blacks. The males show, especially

when courting, an erectile fleshy horn above each eye, and a loose wattle, capable of being inflated, like an apron on the throat. The best-known species are the Indian Crimson Tragopan (*C. satyra*) and the Black-headed Tragopan (*C. melanocephala*), inhabiting the forests on high ranges. In courtship the male 'shows off' his beauty in an elaborate way before his desired mate. The other species are *C. blythii* from Upper Assam, *C. caboti* from south-west China, and *C. temminckii* from Central China. The tragopans are capable of acclimatisation, and possibly domestication, in Britain.

Tragus, or BOCK, HIERONYMUS (1498–1554), one of the founders of modern botany, was born in the Odenwald. He studied theology, the humanities, and medicine, became a teacher, then keeper of the duke's garden at Zweibrücken, and in 1532 preacher at Hornbach, where he also practised medicine, and where he died. For a time he had to take refuge, as a Protestant, with Count Philip of Nassau. His *New Kreutterbuch* (1539) gives exact descriptions of plants, not in Latin, as was usual, but in German. For his historical importance, see Greene, *Landmarks of Botanical History* (i., Washington, 1909). See also BOTANY.

Traherne, THOMAS, poet and prose-writer, the son of a Hereford shoemaker (perhaps originally of Welsh descent), was born about 1636 (or a year or so earlier), entered Brasenose College, Oxford, in 1652, and took his degree in divinity. In 1657 he became rector of the Herefordshire village of Credenhill, and from 1667 till his death in 1674, at Teddington, near Hampton Court, Traherne was chaplain to Sir Orlando Bridgman, who was for some time Lord Keeper of the Seals. Traherne's poetry dates more from the earlier part of his life and his prose from his later years. A controversial work, *Roman Forgeries*, appeared in 1673, and a prose work, *Christian Ethics*, in 1675 (neither, however, retaining its interest for the modern reader), but nothing else of his work (except a small pamphlet) was published till the 20th century. Some MSS. were sold out of a county library in 1888, and were nearly published by Dr Grosart as Vaughan's work. Mr Bertram Dobell edited the *Poetical Works* in 1903, and the prose *Centuries of Meditations* (partly autobiographical) in 1908, while Mr H. I. Bell discovered some new material in the *Poems of Felicity* (1910). Traherne's lyrics anticipate those of Blake and Wordsworth in their passionate intensity and spontaneous enthusiasm, but are almost surpassed by the *Centuries of Meditations* for nervous vitality and felicity of expression. A contemporary described Traherne as 'very affable and pleasant in his conversation, ready to do all good offices to his Friends, and Charitable to the Poor almost beyond his ability.' See a study by Gladys E. Willett (1919)

Traill, HENRY DUFF (1842–1900), D.C.L., educated at Merchant Taylors' and St John's, Oxford, and called to the bar in 1869, was soon absorbed in journalism, wrote books on Sterne, Coleridge, Strafford, William III., Shaftesbury, Sir John Franklin, and others, and edited *Social England* (6 vols.) and *Literature* (for the *Times*). He contributed STERNE to this work. *The New Lucian* (1884), of which a new edition appeared just before his death, is a brilliant series of 'Dialogues of the Dead,' and is his most original work. Others were a book on *Central Government*, one on Egypt (originally letters thence to the *Daily Telegraph*), *The New Fiction*, and some plays and verses.

Training. See ATHLETICS, GYMNASTICS, ROWING. For train-bands, see MILITIA; for training-colleges, see EDUCATION.

Trajan (MARCUS ULPIUS TRAJANUS), Roman emperor, was born at Italica (near Seville) about 56 A.D., and gaining distinction in the Parthian and German campaigns, was made prætor and consul (91), and adopted (97) by Nerva as his colleague and successor. He became sole ruler in the following year. In 101 Rome for the first time beheld its emperor leading forth his legions when Trajan set out on his first campaign against the Dacians. The struggle was long and fierce; but the Romans at last gained a decisive superiority, and in 105 completely subdued the country, which thenceforth became the Roman province of Dacia. In 113 the emperor left Italy for his great expedition in the East, directed mainly against the Parthians. Landing in Syria he made Armenia and Mesopotamia into Roman provinces, and advanced to Ctesiphon on the Tigris, meeting however with actual defeat at Ctesiphon and Hatra. Meanwhile the Jews rose in Cyprus and Cyrene and made fearful massacres; and other enemies took advantage of the emperor's absence in the far east. Trajan took ship for Italy, already in failing health, and was overtaken by death at Selinus in Cilicia, August 117. Though most of Trajan's reign was spent in the field, the internal administration was carefully and excellently guided; the administration of justice was vigorous and impartial; that of finance was equally admirable; informers (*delatores*) were severely punished, and peculating governors of provinces rigorously prosecuted. The improvement and beautifying of Rome was carried on; the empire was traversed in all directions by new military routes, canals and bridges were constructed, new towns built, the Via Appia was restored, the Pontine Marshes partially drained, the magnificent 'Forum Trajani' erected, and the harbour of Centum Cellæ (Civita Vecchia) constructed. His mildness and moderation were proverbial; and though he persecuted the Christians, it was because he regarded the new religion as distinctly subversive of the state. His famous letter to Pliny (q.v.), then legate in Bithynia and Pontus, shows his character in this regard, and his sincere desire for the comfort and happiness of his subjects is reflected in the customary wish formally uttered on the occasion of an emperor's accession—that he might be 'happier than Augustus, better than Trajan' (*Augusto felicior, Trajano melior*). A popular mediæval legend even described him as saved by the prayers of Pope Gregory I. from the pains of hell. Trajan's Column is described at ROME, Vol. VIII. p. 763. Trajan's Wall is the name given to an old Roman earthwork in the Dobrudja, running from the Danube above Cernavoda to Kustendji on the Black Sea; it is an earthen wall, 8 to 15 feet high, and was defended against the Russians in 1854.

There are works on Trajan by Francke (2d ed. 1840), Dierauer (1868), and De la Berge (1877). See also Merivale, or other histories of the Roman Empire by Mommsen, Ihne, H. Schiller, Duruy, Greenidge (1905).

Tralee, a town of County Kerry, on the Lee, about a mile from where it discharges into Tralee Bay, and 207 miles SW. of Dublin by rail. There is a ship-canal to the sea, but the trade of Tralee as a port has decayed since larger ships took to discharging at Fenit, 5 miles along the bay. Tralee returned a member to parliament till 1885. Pop. (1926) 10,536.

Tram. See SILK, p. 393.

Trammel-net, one of the commonest of the *moored nets* described in the article FISHERIES.

Tramps. See VAGRANTS.

Tramways (Old Swed. *tram*, 'log, wooden sledge'). In the article on Railways (q.v.) the early application of rails for purposes of locomotion was referred to. From very early times

stone and wood had been used to lessen friction in the traction of heavy weights at quarries and collieries. The first use recorded of iron for this purpose was in 1738, when a 'plate-way' was laid at Whitehaven. Again in 1767 some cast-iron rails were laid in Coalbrookdale, and ten years later a cast-iron 'tramway' was nailed to wooden sleepers in a colliery belonging to the Duke of Norfolk near Sheffield, after the design of John Carr. Fearing a reduction of wages or lessened employment in the future, the labourers employed got up a riot and tore up the road, the inventor having to flee for his life. This 'tramway'—a name said falsely to be derived from one Benjamin Outram belonging to a Derbyshire family—as in other earlier specimens had a flange cast on its outer edge to keep the wheels on the road. It was not until 1789 that the great improvement was made of transferring the flange from the rail to the tire of the wheel, the track then assuming its present form.

In 1801 a tramway 28 miles in length, something of the modern type, was constructed for the Tredegar and Sirhowy ironworks in South Wales, and in the same year a public act was passed for the laying of a line near London from Wandsworth to Croydon. This tramway, which was designed for extension to Reigate, was intended to furnish a more ready means of transport (by horse and mule power) of coal and merchandise from the Thames to the districts south of London. But the undertaking failed to fulfil the hopes of its promoters, and on the discontinuance of its working the greater part of the route was occupied by the Brighton Railway Company.

The rapid development of the locomotive effectually diverted attention in England from the utilisation of rails for the purposes of ordinary street traffic; but as everything that tends to economise labour has for many years past found special favour in the United States, the Americans were not slow to discern the merits which the tramway system offered for the movements of the population. The Fourth Avenue (Harlem) Tramway was chartered in New York in the year 1831, about the time that the Manchester and Liverpool Railway was opened for traffic, but for about twenty years maintained a monopoly of the street railway traffic. A rapid extension of the system then followed, as towns in different parts of the Union increased in size. Philadelphia and Boston established street tramway lines in 1857. All of these were, of course, operated by horses, but steam, cable, and other methods of mechanical traction came into use, though it was not until electric traction was introduced that tramways developed very greatly. Now, every place of any importance has its electric tramways, and many of these lines have been developed to connect neighbouring cities, townships, and villages by means of inter-urban railways, many running on their own right of way and operating practically as railways. So much so, indeed, that, in the United States, these lines carry much of the local railway traffic, and except in the very big cities of America, the standard railways do little in the way of catering therefor, as the tramways and inter-urban railways meet all requirements in this respect. In European countries, too, electric street railways or tramways are general, while there are lines here and there which can be compared with the American inter-urban lines. 'Gas-electric' cars are in use in some places where the traffic does not warrant the erection of overhead conductors and the provision of an electric generating-plant.

The reintroduction of tramways into the United Kingdom in 1858–59 was not a successful venture. An enterprising American (George Francis Train) obtained permission to lay several short lines in different parts of the country. The one first laid was at Birkenhead; but the London lines were all laid down without special parliamentary authority, and their removal as a nuisance to existing traffic was, after a short trial, decreed by the different vestries concerned. The first successful street tramway system in Britain was established in Liverpool in 1868, followed in London in 1869–71, and afterwards in Glasgow, Edinburgh, and Dublin. These were all worked by horse-traction. The first horse tramway in France was on a line from Paris to Saint Cloud in 1856, and it was called the 'American' railway; the first line in Paris itself was laid in 1875. With the development and success of the tramway system, the attention of inventors and engineers was turned to the devising of some kind of mechanical propulsion. Horse-traction proved too slow and expensive. Many methods were suggested—steam, gas, compressed air, and vapour motors, and others; but, with the exception of steam, which was tried in several places and found unsuitable, nothing resulted from any of them. Later the cable system had an extensive use, and electricity is now the universal system. The cable system is based on a very old method of traction. Various patents have been taken out for the laying of an underground pipe in which a rope or cable should travel, with a grip attachment on the cars capable of picking up or letting go the travelling cable. The first practical adoption of the idea was made in San Francisco by a Mr Halladie in 1873. The road in some parts had very steep gradients, impracticable for a horse-car line, and the success of the new method was at once established. This success led to the introduction of the system into Britain, and lines were laid by American engineers on Highgate Hill in 1884 and afterwards in Edinburgh, where steep gradients exist, and in Birmingham, Bristol, and other places. Although electricity had been used as early as 1835 for the propulsion of cars, it was not till after the invention of the dynamo that it became a practical method. Many experiments were made between 1879 and 1883 to prove the practicability of this system, but the first line opened, on the overhead trolley system, was in Kansas City in 1884. In electric traction, each car is supplied with one or more motors for its propulsion, and the chief difference between the various systems is the method of supplying the electric current. In the overhead trolley system, the current is taken from an overhead wire conductor by means of a trolley wheel carried on a pole extending upward from the roof of the car. The current passes down the trolley conductor to and through the motor, and returns to the central station by means of the rails. The advantages of this system, as compared with the cable, in respect of increased speed and general efficiency, have led to its almost universal use in the United States, not only in new lines, but also in supersession of previously existing cable systems. In Great Britain all large towns and many smaller ones now have their own electric tramway system, and in many cases a great deal of the purely local traffic is conveyed thereby. The solvent operation of the tramways is, however, seriously menaced in many places by motor-omnibus services since introduced, and although this aspect is modified in some towns by the exercise of local oversight over public service transport to prevent unrestricted and unreasonable competition, and in other cases the municipalities themselves operate both tramway and motor-omnibus undertakings, it seems practically certain that there will not be many new tramway routes opened in future. It is still realised, however, that, where the traffic is of great volume, the already-existing electric tramways fully justify themselves,

and it is mainly in respect of projected extensions and routes where traffic is light that electric tramways must now be regarded as less satisfactory and more costly than motor omnibus services. Thus, in London, Birmingham, Manchester, Glasgow, Edinburgh, and other large towns, the tramways carry such loads that their replacement by motor-omnibuses is not regarded seriously. For extension services, including plying within town limits for through traffic, the electric tramway is not now favoured, and here and there light traffic routes are being closed down. Speaking generally, however, all the bigger towns and many smaller ones depend, and will continue to depend, very largely upon electric tramway services. There are now some 242 tramway undertakings in Great Britain, 170 owned by local authorities, and 72 by companies. Over 2600 route miles are in use, 1860 by local authorities, and 750 by companies. Track mileage is about 4400, annual car-miles number about 380,000,000, and the number of passengers conveyed in twelve months is over 4,600,000,000. Some 13,000 vehicles are in use. Nearly all electric tramways take current from overhead wires, but the conduit system is used in central London, and here and there in other places. More recently trackless trolley routes have come into use. The cars take current from overhead wires, but can move freely about the road surface on their routes, as in the case of motor-omnibuses. There are now about 20 such undertakings in service. See ELECTRIC RAILWAY, and Dawson, *Electric Railways and Tramways* (1897); also the Parliamentary Returns on Tramways, and G. I. Phillips, *Tramways Act, 1870, with Introduction, &c.* (1890).

Trance, a morbid sleep, differs from natural repose in duration; in profound insensibility to external impressions; in following excitement and the exaltation of certain instincts, chiefly the religious and amative, rather than fatigue or exhaustion; and in being the concomitant or symptom of diseases of the nervous system, particularly Hysteria (q.v.). It differs on the other hand from Coma (q.v.) in not being associated with serious organic disease, and in the absence of stertorous breathing, muttering, delirium, &c. See SLEEP, INSANITY, CATALEPSY, ECSTACY.

Tranent, a police-burgh of Haddingtonshire, 10 miles east of Edinburgh. It has a fine school and Colonel Gardiner's grave. Coal has been mined since 1219. Pop. (1851) 2096; (1921) 4763.

Trani, a seaport and archiepiscopal city of Southern Italy, 28 miles NW. of Bari, with a very fine 12th-century cathedral with three apses, a crypt, a campanile, and bronze doors made by Barisanus, a native of the place, whose handiwork is also found elsewhere; there are other interesting buildings. It has some trade in country produce, but the harbour is nearly sanded up. Pop. (1921) 34,568.

Tranquebar (*Tarangambádi*), a seaport of Madras Presidency, 18 miles N. of Negapatam. A Danish settlement from 1620 to 1807, it passed finally to the English in 1845 for 12½ lakhs of rupees, but the construction of the railway to Negapatam (1861) diverted its trade. The first Protestant mission to India was established here in 1706. Pop. (1921) 11,520.

Transcaspian Railway, starting from Krasnovodsk on the Caspian, goes through Merv and Bokhara to Samarkand, and since 1895 has been continued to Tashkand and Andijan. It has a branch from Merv to the Afghan frontier, and connects with the main Russian system by a line from Tashkand to Orenburg (1903).

Transcaucasia, a federal Soviet republic formed in 1922, consisting of the republics of Armenia, Georgia, and Azerbaijan, and itself a member of the Russian federation. The capital is Tiflis. Within the several republics various degrees of autonomy have been granted to Nakhitchevan, Nagorni-Karabach ('Mountain Republic'), Abkhasia, Adjaria, and the South Ossetian Territory —the North Ossetian Territory being on the European side of the Caucasus, in the North Caucasian Area of Russia proper.

Transcendentalism. The words transcendental and transcendent (*transcendentalis, transcendens*) were employed by various Schoolmen, in particular Duns Scotus, to describe the conceptions that, by their universality, rise above or transcend the ten Aristotelian Categories (q.v.). Thus, according to Scotus, *Ens*, or Being, because it is predicable of substance and accident alike, of God as well as of the world, is raised above these by including or comprehending them; it has the same relation to the sum of the categories as the *summum genus* to the various genera within a single category. Further, the predicates assumed by Scotus to belong to *Ens*, or simple existence—the One, the True, the Good—are styled transcendent, because applicable to *Ens* before the *descent* is made to the ten classes of real existence.

Between the hitherto convertible terms, transcendental and transcendent, Kant himself drew a distinction of considerable importance for the understanding of his system. By the word 'transcendental' he designates the non-experiential, *a priori* elements of thought (see KANT)—especially the forms and categories (space and time, causality, &c.) which in his view, though they are not products of experience, are manifested only in experience, and contribute an essential element in all experiential knowledge. The word 'transcendent' Kant reserves for those among the transcendental or *a priori* elements that transcend and lie beyond all experience; they may seem to be given in experience, but they are not really given, and are in so far illegitimate as cognitions (though *belief* in them may be attained in other ways). Such are the 'ideas of the pure reason,' God, an immaterial soul, &c.

For post-Kantian systems which affirmed the identity of subject and object the distinction of transcendental and transcendent ceased to exist, and absolute knowledge was practicable; such systems are said to be or contain *transcendentalism*. 'Transcendental Philosophy' was Schelling's own name for an important part of his system (see SCHELLING). Oken and others carried much of this transcendentalism into their *a priori* construction of the nature-philosophy—in which in some cases scientific fact had to yield to speculative deduction. Transcendental has also often been used by 'common-sense' philosophers and the association school for the *a priori* generally. And in vulgar parlance the word applies to what is disapproved of as abstruse, speculative, obscure, fantastic, and as such absurd; it is specially familiar as a criticism of almost any form of idealism. See IDEA.

The epithet of Transcendental School has come, however, to be specially associated with a group of American authors and thinkers, who early in the 19th century led and cherished a wide-spread reaction against time-honoured Puritan prejudices, humdrum orthodoxy, old-fashioned metaphysics, and materialistic philistinism and utilitarianism. The movement was identified with idealism, vague pantheism, mysticism, and eclectic orientalism, and had at times a distinct flavour of the pedantic, the paradoxical, and the extravagant. Among the main exciting causes were the influence of Carlyle and the discovery of the new world of German literature. Brook Farm (q.v.) was one outcome of the school. The first meeting of the Transcendental Club took place in 1836 in the house of George Ripley (q.v.); other conspicuous members

of the school were Margaret Fuller and Theodore Parker. Many well-known American authors, such as Hawthorne, have at some time shown affinities that way. But the thinker who most effectively summed up what was best in the movement, gave it the most permanent expression, and secured the widest hearing, was Ralph Waldo Emerson (q.v.). See O. B. Frothingham, *Transcendentalism in New England* (New York, 1876).

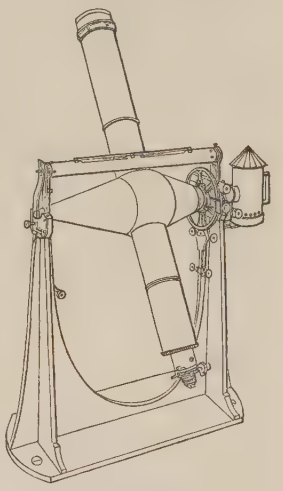
Transept. See CHURCH.

Transfiguration, FEAST OF THE, instituted in honour of the Transfiguration of Christ (Matt. xvii. 2), is one of the twelve great feasts which come next after Easter in dignity. In the Anglican Church it is only a Black-letter feast. It is commonly said to have been instituted in the West by Pope Calixtus III. (1455-58), but is mentioned in the 9th century. Both Greeks and Westerns keep it on the 6th of August.

Transformer. See ELECTRIC LIGHT.

Transfusion of Blood consists in the transference of blood from the veins (or arteries) of a healthy person to one whose blood is so impoverished as to endanger life. The earliest case on record is, so far as we know, that of Pope Innocent VIII., who is said to have been unsuccessfully operated on in April 1492. In 1667 the operation was performed both in France and England, apparently with success; but it again fell into oblivion till 1824, when Dr Blundell, in his *Researches*, proved the feasibility of the process. Since that time it has been regarded as a legitimate operation, and has frequently been successful in apparently hopeless cases; but the difficulties attending it are sufficiently indicated by the number of different procedures and kinds of apparatus devised for its performance. It has been used most frequently and successfully in cases of profuse hæmorrhage after child-birth; but also in many other conditions—e.g. phthisis, puerperal fever, pernicious anæmia, poisoning by agents which destroy the blood-corpuscles or impair their activity. The blood of the lower animals has been shown to be dangerous for this purpose; further, the serum of certain persons clumps or destroys the corpuscles of others when blood is injected. The first requisite, therefore, is to find a healthy person able to spare blood enough for the purpose. Next the blood corpuscles of this person (donor) must be tested with some serum from the patient (recipient), to make sure that they are compatible. The chief difficulty in the performance of the operation is the prevention of coagulation of the blood before it reaches the blood-vessels of the patient. The process was much used in the late European war, and coagulation of the donor's blood was prevented either by smearing all tubes, needles, &c., before use with melted paraffin, or by mixing the blood, as it flowed from the donor's vein, with citrate of soda solution, and transfusing the mixture into the vein of the recipient.

Transit-instrument, one of the most important of astronomical instruments, consists of a telescope fixed to a horizontal axis, so as to revolve in the plane of the meridian. It is employed, as its name denotes, in the observation of the meridian transits of the heavenly bodies—i.e. the apparent passage of the heavenly bodies across the observer's meridian, an appearance due to the revolution of the earth (for the transits of Venus, see SUN, Vol. IX. p. 772). The axis, which is the most important part of the instrument, and thus demands the utmost care in its construction, consists of a hollow sphere or cube, to opposite sides of which are tightly fastened the bases of two cones in whose apices the pivots are screwed; the sphere or cube is pierced for the admission of the telescope, which is firmly soldered at right angles to the axis. One of the pivots is hollowed so that a stream of light can be directed from a lantern, through an aperture in the side, and half-way along the interior of the axis, into the telescope tube, where, being received by an annular mirror set at 45° to the axis and telescope tube, it is directed to the eyepiece, and brilliantly illumines the field of view, while the annular form of the mirror prevents any interference with the passage of rays from the object under observation to the eye. The pivots must be very carefully turned to a perfectly cylindrical form, and fitted into the instrument, so that their axes are accurately in line. One extremity of the axis carries one and sometimes two small graduated circles, each supplied with index, clamping screws, and vernier; these circles are capable of indicating angular measures to within 1′ or 2′. The pivots rest on massive blocks of stone or other stable material which is little affected by change of temperature, stability being the great mechanical essential of the instrument. This condition satisfied, there are three adjustments necessary before a transit can be observed: the axis must be horizontal; the line of collimation must be at right angles to the axis of motion; and the latter must be placed so as to point accurately east and west. On the perfection of the first two of these adjustments depends whether the telescope sweeps over a great circle of the sphere, and the third is necessary to ensure that this great circle shall be the meridian of the place of observation. These adjustments can never be made quite perfect, and the usual mode is to investigate the amount of error in each, and allow for it in the apparent result. To note accurately the instant of time by the astronomical clock at which the object (e.g. a star) is seen to pass the centre of the field of view is the essential part of a transit observation. The most effective method is to register the beats of the clock by an apparatus which at the end of each oscillation of the pendulum marks a dot upon a uniformly moving slip of paper. This is effected by the agency of electricity, and is one of its most valuable contributions to astronomical science. At a certain point in each oscillation of the pendulum it becomes part of a complete galvanic circuit, the contact being immediately broken by its progression in its oscillation; and it is at these points that the galvanic agency causes the dot to be made. The instant of a transit's occurrence is similarly noted by the observer, who, by a tap on a break-circuit key, fastened to the side of the transit-instrument, causes the graver to make an extra dot; and the distance of this dot from the previous seconds one, compared with the distance between two seconds dots, gives the time accurately almost to $\frac{1}{100}$ of a second. Various ingenious modes of registering have been proposed, all founded on the above principles. It is from the times of transit of the several heavenly bodies thus accurately observed that their right ascensions are determined.



Transit-instrument.

There has been found part of what has been

called a transit-instrument made for Tut-ankh-amen (*Nat.* 1924, p. 756). The transit-instrument strictly so called was invented by Römer about 1690. One was erected in Greenwich Observatory by Halley in 1721; but it was little used till 1742. Troughton's transit-instrument there was erected in 1816.

The transit-circle differs mainly from the older transit-instrument in the addition, on the axis of rotation, of two large graduated circles which are read off by microscopes fixed on an independent coaxial wheel called an alidade, any variation in the position of which may be detected by a large spirit-level attached to it. This instrument is as well suited for giving the declinations as for giving transits or right ascensions.

Transition is a term applied to the architectural features of buildings erected at periods intermediate between the fully-developed 'styles' technically so called. Thus in Britain there is a transition between the Norman and First Pointed or Early English, another between the First Pointed and the Decorated or Middle Pointed, and a third between the Middle Pointed or Decorated and the Perpendicular. See ARCHITECTURE.

Transjordan. See KERAK.

Transkeian Territories, a part of the Cape Province, lying between the great Kei River (the boundary of British Kaffraria) and the borders of Natal. Covering most of the former Kaffraria proper, they are made up of Griqualand East, Tembuland, Transkei proper (comprising the districts of Idutywa, Kentani, Nqamakwe, Tsomo, and Willowvale), and Pondoland. The last was annexed in 1894, but has, for native administration, a general council independent of that of the other Transkeian Territories. See CAPE OF GOOD HOPE.

Translation, the art of rendering what is written in one language into its corresponding sense in the words of another. Obviously it should first be faithful—a reproduction of the sense and ideas rather than a paraphrase; contrasted with this prime quality all such ends as preserving the colour, the music, the idiomatic vigour, the distinctive manner of the original are counsels of perfection. To translate perfectly is to interpret to the last detail; and to interpret it is necessary to understand. The feeling is more important than the exact word, and the admonition of Dryden may be commended to the adult translator, if not the schoolboy—not 'to lacquey by the side of his author, but to mount up behind him.' It is difficult enough to express one's own meaning to one's wish; doubly difficult is it so to realise another's as to express it as he would have done had ours been his mother-tongue. A literal translation is better than a loose one, but obviously in the case of idioms and metaphors of special meaning the literal rendering cannot be the right one, for in such mechanical transposition the spirit and perfume will be found to have evaporated in the transfusion. 'Translation from one language into other,' said Don Quixote, 'is like looking at Flemish tapestries on the wrong side; for though the figures are visible, they are full of threads that make them indistinct, and they do not show with the smoothness and brightness of the right side. Yet,' he continues, 'a man may employ himself in ways worse and less profitable to himself,' and we need not cut ourselves off from some of the richest springs of human thought and experience because the drinking vessels available are seldom of exquisite workmanship. A prose translation of a poem like the *Iliad* or the *Æneid* can be of course only an approximation to the ideal translation—a shadow of the reality, like the music of the sea, heard but in a shell, the colour being lost, the light and shade altered as in a photograph. Yet such translations as those of the *Odyssey* by Butcher and Lang, the *Iliad* by Leaf, Lang, and Myers, Theocritus by Lang, Sophocles by Jebb, Pindar by Myers, Virgil by Conington or Mackail, the *Inferno* by Dr Carlyle or C. E. Norton, the *Purgatorio* and *Paradiso* by A. J. Butler, are masterpieces of triumph over the difficulties of their kind. Of all books the Bible, or more strictly the New Testament, loses least in translation, the language being itself a product of a degenerate stage of Greek, the ideas to be conveyed relatively direct and simple, the matter being much more heeded than the manner. Fortunately for our literature the English translation was made at a time when the language had reached its period of fullest simplicity and vigour.

To lay down canons of translation will not help much in the matter, for the best translators are those who possess an individuality as well as their originals, such as Edward FitzGerald, whose versions from Calderon and Omar Khayyam, wide of their text as they frequently are, yet succeed to perfection in reviving in a sympathetic English reader the effects produced by the original. Hookham Frere's free versions of Aristophanes are perhaps the best things of their kind that have ever been done. The translation ought to be such that the reader should, if possible, forget that it is a translation at all, and be lulled into the illusion that he is reading an original work. Or again, the translator should retain every peculiarity of the original, so far as he is able, with the greater care the more foreign it may happen to be. Such are some of the more or less perfunctory attempts to lay down definitions of translation, and we need only say in short that this, instead of being the easiest, is one of the most difficult of tasks, only to be essayed by men who are at once masters of both languages and of the subject-matter of the book to be translated. What men thus adequately equipped can make of an ancient author we see when we turn to Jowett's Plato, Munro's Lucretius, Conington's Persius, Long's Marcus Aurelius and Epictetus, Reid's *Academica* and *De Finibus* of Cicero, Church and Brodribb's Tacitus, also the *History* by Albert W. Quill, Rann Kennedy's Demosthenes, Jebb's *Characters* of Theophrastus, Shuckburgh's Polybius, Lewis' Juvenal, Macaulay's Herodotus, Welldon's Aristotle (*Rhetoric* and *Politics*), and the *Ethics* by F. H. Peters, Verrall's Æschylus (*Agamemnon* and *Septem contra Thebas*), Dakyns' Xenophon; or, of English translations from modern languages, the *Thousand and One Nights* of Edward Lane, of John Payne, and of Sir R. Burton; the *Don Quixote* of John Ormsby, and of H. E. Watts; Pascal's *Pensées* by Kegan Paul; Van Laun's Molière; Carlyle's *Wilhelm Meister;* and from the old Icelandic, the 'Saga Library' of Morris and Magnússon. Urquhart's Rabelais, Florio's Montaigne (as well as that by Cotton), North's Amyot's Plutarch, Shelton's *Don Quixote*, Painter's *Palace of Pleasure*, Philemon Holland's Livy, Hobbes's Thucydides; as also such metrical translations as Gavin Douglas' *Æneid*, Harrington's Ariosto, Fairfax's Tasso, belong to a special group in English literature, valued more for their excellent English than for their accuracy. Among modern poetical translations especially notable are Coleridge's *Wallenstein*, Gifford's Juvenal, Cary's Dante, Calverley's Theocritus, Philip Worsley's *Odyssey* and that by William Morris, Plumptre's Æschylus, E. D. A. Morshead's trilogy of Æschylus (the *Agamemnon* better than Milman or Robert Browning), Lewis Campbell's Sophocles, W. H. Pollock's *Nuits* of Alfred de Musset, Lang's *Ballads and Lyrics of Old France*, Rossetti's group of translations from Italian poets entitled 'Dante and his Circle.' The difficulty of translating is well expressed in the punning Italian proverbial

saying, that the translator is a betrayer (*Traduttore traditore*). Elphinstone's Martial has the merit of being among the worst, and Dryden's versions of part of Juvenal among the best, of their kind. Horace, the despair of translators, has yet been well treated by Conington and Sir T. Martin; Homer forms a library of itself, famous poetical versions being those by Chapman, Pope, Cowper, and Lord Derby; Chapman preserves the strength of the original, but his fanciful quaintness is a grievous impediment. Pope's *Iliad* is a noble poem, but, as Bentley said with fatal truth, 'you must not call it Homer.' It lacks its naturalness, its flowing simplicity, the Homeric ideas having gained a completely un-Homeric colour in the crucible of a characteristically 18th-century intellect.

There are some excellent remarks on translation by Jowett, in the preface to the third edition (1892) of his Plato.

Transmigration. See REINCARNATION.

Transmission of Power means the doing of useful work at a distance from the engine or whatever other source supplies the energy. An ordinary tow-rope evidently fulfills such a function; and in a wide sense all forms of connecting rods, Belts and Belting (q.v.), and similar gearing (see WIRE) do the same. The revolving shaft of a screw-steamer transmits rotatory motion through a considerable distance; but for long-distance transmission ordinary mechanical devices, if they do not altogether fail, lose greatly in efficiency. In a series of shafts geared one to another by beltings there must be considerable loss through slipping. In the Pneumatic Despatch (q.v.) and in Boring (q.v.) compressed air has been successfully applied as a transmitter of power. Electricity, however, is the most promising agent for indefinite transmission of power. Thus a dynamo-electric machine may be worked by a waterfall; its voltage or potential may be transmitted along wires to distant stations, and there generate electric currents capable of driving an electric motor and keeping a whole factory in operation. Such transmission of power for 200 miles or more may be commercially successful. This principle is now being systematically applied throughout Great Britain. See DYNAMO-ELECTRIC MACHINES, ELECTRIC LIGHT, NIAGARA.

Transmutation of Elements, especially of other metals into gold, was the aim of Alchemy (q.v.). The study of radio-activity has shown that such changes actually occur. See RADIUM; also LEAD, p. 564. The production of gold from mercury has been reported, and of mercury from lead.

Transpadane Republic. See CISALPINE REPUBLIC.

Transpiration. See PHYSIOLOGY (VEGETABLE), LEAF, STOMATA.

Transplanting, the act of removing bodily a plant or tree from the place in which it grows, and establishing it in some other place. The operation goes on in gardens and nurseries throughout the year. But for the facility with which the great majority of cultivated plants may be transplanted, gardens would be comparatively profitless and uninteresting, and pleasure-grounds and the landscape be adorned with few but indigenous forms of trees, shrubs, and flowers. In the large trade nurseries transplanting is one of the chief occupations of the workers. Seedling forest trees are reared annually in hundreds of thousands, and either are transplanted in the nursery to adapt them for special purposes, or are transferred from the seed-bed at the age of one or two years direct to moors and hillsides to form woodlands. Ornamental shrubs from all temperate countries are in the same way prepared for distribution. Fruit trees are especially benefited by the process. By frequent transplantings fruitfulness is accelerated in young fruit trees, and the operation is systematically resorted to in order to maintain fertility in those that are more aged.

The operation is most practicable in the youthful stage of all plants. In those that are aged and have been long established in one place it is attended with danger, chiefly because in the case of large trees and shrubs it is impracticable to preserve uninjured a sufficiency of the fibrous roots to draw nourishment from the soil. Yet very large trees have been successfully transplanted, and sylvan effects have been created in bleak, treeless situations in two or three years by this means, which would have taken half a century to produce in the ordinary course. In moving trees of a size exceeding that which two or three men may easily handle, transplanting machines are required. These may be ponderous four-wheeled carriages in which the tree is swung in chains or on a platform upright as it grew, and may be carried any distance where bridges overhead do not occur in the way. A lighter two-wheeler type has the disadvantage that the tree must be carried in a horizontal position. The transplanting of large trees successfully involves the possession of considerable experience of the work by the person superintending it. He should know the proper time or season for the transplanting of each kind of tree with which he has to deal. Various kinds of trees are not all amenable to the same methods. Greater care is required in every stage of the work with some than with others. The prime object to keep in view in every case is the preservation of the fibrous roots; every one of these destroyed lessens the chances of success. When it is determined to transplant trees which have been growing undisturbed for some years, it is necessary to prepare them one or two years prior to lifting them. A trench is opened in a circle 2, 3, or more feet—according to the age and size of the tree—from the bole all round, and all the roots are cut off beyond the circle. The trench is carried deep enough to reach all the roots, and is then filled up either with the earth excavated or, in cases requiring special care, with soil of a kind more favourable to the formation of fibrous roots. The mutilated roots send out new feeders into the new soil, and if the work has been properly done they will be numerous enough one or two years hence, according to the peculiarities of the subject, to bind the new soil in a compact mass, and thus facilitate the transportation of a considerable ball of earth along with the tree.

Limes, poplars, willows, and such-like quick-growing and free-rooting trees are more easily transplanted when of considerable age than oak, beech, sycamore, and the like. Evergreen trees and shrubs transplant most successfully in spring, when they are beginning to grow. Deciduous subjects on the other hand succeed best when transplanted immediately after the fall of the leaf. Surrounding the roots with light compost and watering, and mulshing the area over which the roots extend to lessen evaporation, are ordinary but essential means to success, especially in the case of large and difficult subjects. Securing the tree at once against disturbance by wind after it is planted is of vital importance.—For the transplanting of skin, see SKIN, RHINOPLASTIC OPERATIONS; and of teeth, see DENTISTRY.

Transportation, technically as distinguished from Banishment (q.v.), the removal of offenders beyond seas, but loosely used for the removal of convicts to foreign or distant regions by sea or land. The history of English transportation is fully treated at PRISONS. For French and Russian transportation, see GUIANA, NEW CALEDONIA, SIBERIA.

Transposing, in Music, is changing a piece of music in performance from the key in which it is written to another key. To play at sight an accompaniment for such an instrument as the pianoforte or organ, transposed from one key to another, requires considerable artistic skill. To the singer transposal presents no difficulties.

Transubstantiation. The meaning of the theological term transubstantiation is made apparent in the following canon of the Council of Trent: 'If any one shall say that, in the most holy sacrament of the Eucharist, there remains the substance of bread and wine together with the body and blood of our Lord Jesus Christ; and shall deny that wonderful and singular conversion of the whole substance of the bread into the body, and of the whole substance of the wine into the blood, the species of bread and wine alone remaining—*which conversion the Catholic Church most fittingly calls Transubstantiation*—let him be anathema' (*Conc. Trid. Sess.* xiii. Can. 2). The canon just quoted was intended as a condemnation of the theories of impanation and consubstantiation. According to the theory of impanation, which was advocated chiefly by Osiander, in the sacrament of the Eucharist the bread and wine are hypostatically or personally assumed by the Divine Word. According to the theory of consubstantiation, which was favoured by the large majority of the Lutherans, the substance of the bread and wine remain together with the body and blood of Jesus Christ, but without being hypostatically assumed.

The doctrine of transubstantiation is then an article of Roman Catholic faith. Furthermore, the Council of Trent in the same Session xiii. declares that this doctrine 'has always been the conviction in the church of God.' Protestant divines call in question the truth of this declaration, and assert that the doctrine was unknown before the middle ages. Roman Catholic theologians on the other hand, while admitting that the *term* transubstantiation is comparatively new, profess their ability to prove by a *catena* of witnesses, commencing with the earliest ages of the church, that the *doctrine* conveyed by the term has been believed from the first. That the *term* is comparatively new is unquestionable. Cardinal Franzelin, indeed (*De Eucharistia*, page 177), gives instances of its use by Catholic writers in the 11th and 12th centuries. Nevertheless it was not formally adopted into the doctrinal phraseology of the church before 1215, when it was employed in a profession of faith drawn up by the fourth Lateran Council. After this period we find the term again employed in a 'confession of faith' which was presented for subscription to Michael Palæologus, the Greek emperor, by Pope Clement IV. (1267), and was professed by the emperor in the second Ecumenical Council of Lyons held in 1274 under Pope Gregory X.

That the *doctrine* conveyed by the term transubstantiation is at least much older than the term all historians must admit. Berengarius of Tours, who had attacked the prevalent teaching on the Eucharist, was required by a council held in Rome under Pope Gregory VII. (1079) to make the following profession of faith: 'I, Berengarius, believe in my heart, and profess with my lips, that the bread and wine which are placed on the altar are *substantially changed into* the true and proper and life-giving flesh of our Lord Jesus.' And in the largely attended council held at Piacenza (1095), seven years after the death of Berengarius, it was once more declared that 'the bread and wine, when they are consecrated upon the altar, are *truly and essentially changed into* the body and blood of our Lord.' In a treatise *On the Sacrament of the Body and Blood of Our Lord Jesus Christ*, written by Paschasius Radbertus (831), the author very plainly stated the doctrine of transubstantiation. Some of the views expressed in this treatise were traversed by Rabanus Maurus, Ratramnus, and other contemporary writers; but the author's teaching on transubstantiation was challenged by no one.

It is admitted, with more or less of unanimity, that from the days of Paschasius Radbertus down to the period of the Reformation the doctrine of transubstantiation was in general acceptance. But when the inquiry turns upon the belief of the early fathers this unanimity disappears. Catholic theologians assert that the expressions employed by the Greek and Latin fathers, when treating of the effect of the Eucharistic consecration on the substance of the bread and the wine, are irreconcilable with any theory but transubstantiation. Leibniz is disposed to grant the truth of this contention. 'The records of pious antiquity,' he writes, 'plainly enough demonstrate that the bread is changed into the body, and the wine into the blood of Christ; the ancients, too, universally acknowledged therein a change of substance, which the Latins have aptly rendered transubstantiation' (*System of Theology*). But in making this concession Leibniz parts company with the great majority of Protestant divines. The latter contend that the change indicated by the language of the fathers is not a change in the substance of the elements, but a change in their use, efficacy, and dignity.

Transubstantiation is a doctrine not only of the Roman Catholic, but also of the Greek Church. In 1643, as a protest against the Calvinist 'Confession of Faith,' which had been drawn up by Cyril Lucaris, and circulated amongst the Christians of the East, and with the view of preventing any further attempts to unite the Reformed and Greek churches, a 'Profession of Orthodox Faith' was formulated by Peter Mogilas, archbishop of Kieff and primate of all Russia, and was subscribed by Parthenius, patriarch of Constantinople, Joannicius, patriarch of Alexandria, Macarius, patriarch of Antioch, Paisius, patriarch of Jerusalem, and the other metropolitans and bishops of the Greek and Russian churches. This profession, which is divided into 'Questions,' treats from question 98 to question 119 of the seven sacraments, explaining the use, nature, sanctity, and efficacy of each. Under question 107 the doctrine of transubstantiation is distinctly enunciated as follows: 'When these words (of consecration) are pronounced, immediately transubstantiation (ἡ μετουσίωσις) takes place; the bread is transubstantiated into the true body of Christ, and the wine into the true blood, the species alone remaining.' At the Synod of Jerusalem, held (1672) under the presidency of the patriarch Dositheus, this profession was solemnly confirmed as the expression of the faith of the entire Eastern Church.

Transubstantiation differs from all natural changes in this, that natural changes, even though they may be substantial changes, such as, e.g., the conversion of food by the processes of assimilation into the substance of the person nourished, or the conversion of wood into ash by the action of fire, are, at most, transformations. When, e.g., wood is converted into ash, the *form* or *active* principle which made the original substance to be wood gives place to a *form* that makes the substance, which is the term of the change, to be ash. But the *matter* or *passive* principle, which before the change was the subject or recipient of the substantial form of wood, remains after the change as the subject or recipient of the substantial form of ash. And thus in all natural changes, even though they be substantial, there is not an entire but only a partial change of substance. The active principle of the original substance is changed, but the *passive*

principle remains. In transubstantiation, however, both the *matter* and the *form* of the bread and wine are changed, for, according to the Tridentine definition, there is a 'conversion of the whole substance of the bread into the body (of Christ) and of the whole substance of the wine into the blood.' Another respect in which transubstantiation differs from all natural changes is indicated by those other words of the Tridentine definition, 'the *species* of bread and wine remaining.' By *species* is here meant *accidents*. As *accidents* have no existence of their own, but exist with the existence of the substance in which they inhere, it follows that when that substance is destroyed its accidents must in the ordinary course of things cease to be. Thus, e.g., the external manifestations and the active and passive qualities of wood do not exist after wood has been converted into ash. But in transubstantiation the external manifestations, such as shape, colour, flavour, odour, &c., the passive powers of corruption, &c., the active powers of nutrition, &c., and the other forces and characteristics of bread and wine, continue to exist and to operate after the destruction of the substances on which they naturally depend. To hold, as Magnan and other Cartesians have done, that these accidents remain as mere phenomena and subjective impressions, void of objective reality, is to hold what is in opposition not only to experience, but also to the common teaching of the Catholic Church, as expressed, e.g., in the 'Catechism of the Council of Trent,' part ii., chap. 4, q. 43. But though the accidents persist after the subject in which they naturally inhere is withdrawn, they do not acquire the mode of being which is proper to substance, for they exist not *per se*, but by the 'extraordinary concursus' of God, and, while not actually existing in substance, they still retain an essential relation to substance as their subject. S. Thomas Aquinas (*Sum. Theol.*: tertia pars, q. 77, art. 2), holding with Aristotle that extension is the 'first disposition' of matter, and that all other accidents in consequence are referable to material substance 'through the medium of extension,' is of opinion that the extension of the bread and wine receives from God the power to act as the 'quasi subject' and support of those other qualities of bread and wine which manifestly exist and operate after transubstantiation has been effected.

Transvaal (till 1900 the SOUTH AFRICAN REPUBLIC), now an original province of the Union of South Africa, bounded on the N. by Southern Rhodesia, on the E. by Portuguese East Africa and Swaziland, on the SE. by Natal, on the S. by the Orange Free State, and on the W. by Bechuanaland. In 1903 a tract of about 7000 sq. m., consisting of the districts of Utrecht, Vryheid, and part of Wakkerstroom, was transferred to Natal. The area of the province to-day is about 110,450 sq. m.

Previous to 1830 the land was a *terra incognita* so far as European knowledge or influence went, and was inhabited by several Bantu clans, speaking Bantu dialects. These clans were ruled by a branch of the Zulu race under the paramount chief Umziligase. The well-timbered savannahs abounded with big game; the larger rivers were filled with alligators, hippopotami, and fowl; and early hunters such as Harris and Gordon Cumming found here a sportsman's paradise. The fifth decade of the 19th century saw the first concerted intrusion of Europeans on this wild scene. A few Cape Colony farmers, offended by some regulations promulgated by certain crown officials, sacrificed their land and belongings, and, taking with them their families and the most rudimentary necessaries of life, struck for the north, preferring the chances of death by wild animals or wild men to the irritating exactions of petty officialdom.

The pastoral wealth of the country was such that during the subsequent years on to 1870 the stream of Boer *voortrekkers* ('pioneers') fitfully continued to enter, fight for, and possess the land. Native wars were of frequent occurrence, and little progress was made in the development of the country. The Boers were essentially pioneers, had none of the trader's instinct, and they did not till the soil to any great extent. The little commerce was in the hands of British firms.

Under Andries Potgieter a rudimentary government was instituted about 1840, and by the Sand River Convention of 1852 the independence of the Boer farmers north of the Vaal River was recognised by the British government. But in 1877, owing to an exhausted public treasury and accumulated debts brought about by chronic native wars, the republic was on the eve of dissolution, and the country about to relapse into barbarism. To avert this catastrophe the British government assumed the care of it, subjugated by imperial forces and Swazi levies certain rebellious natives, and put the finances of the state in order. The promises to the Boers, however, on the subject of self-governing institutions made for the home government at the time the country was annexed were not carried out. Arbitrary officials and military martinets were appointed to rule on behalf of the crown. By reason of their lack of tact, as well as of irritating regulations and the non-fulfilment of political engagements, friction was created between the governing and the governed—the English and the Boers. The spark which caused the explosion that had its final and humiliating episode in Majuba (q.v.) was an ill-timed enforcement of a petty tax. The English officials called out the Queen's troops in ignorance of the fact that the whole state felt sympathetic with a now common cause. Then followed the Transvaal war, the death of General Colley, and the signing of terms of peace, resulting in the conventions of 1880 and 1884 between England and the Transvaal. The first gave the Boers republican rights, but retained British control over boundaries, native affairs, and foreign relations. The 1884 convention gave the state the name of the South African Republic, and restricted British suzerainty to the control of foreign relations. The rapid development of the gold industry greatly increased the financial prosperity, but introduced elements of difficulty into public life. For, as the Boers reserved all political power to themselves, the British and other 'Uitlanders,' to whom the wealth of the country was mainly due, resented not merely their exclusion from political privileges, but the oppressive action of the government in regard to mining regulations, monopolies for the sale of dynamite at exorbitant prices, the unfair incidence of the taxation (the new-comers bearing the great bulk of the burden), and other grievances. The discontent of the Uitlanders, a large majority of the total population, centred principally at Johannesburg, took overt shape in 1895, and led to the disastrous invasion by Dr Jameson in December (see JAMESON). Many acts of petty tyranny further accentuated the discontent, and the shooting of a British subject named Edgar by a Boer policeman finally roused the Uitlanders. A petition signed by 21,000 British subjects was sent to Queen Victoria through the High Commissioner in March 1899, pointing out that their grievances, instead of being remedied as promised, had rather been aggravated since the Jameson Raid; the enforced submission of the High Court to the Raad, and the fact that trial by jury meant trial by Boers, made justice impossible. Negotiations ensued between the Colonial Office and the Boer government, which repudiated British suzerainty and claimed the position of a sovereign international state. A con-

ference between Sir Alfred (later Lord) Milner, the High Commissioner, and President Kruger was held at Bloemfontein (31st May) to consider certain franchise and other proposals, but without effect, the suzerainty being still repudiated and the arbitration suggested by the Transvaal government being rejected by the Home authorities; and relations rapidly got more strained. In September the Orange Free State announced its determination at all hazards to support the Transvaal, which sent large bodies of burghers to the frontier and seized £800,000 of gold from the mines. The British government in reply called out 25,000 of the reserve forces. On 9th October the Transvaal presented a note demanding that all troops on the frontiers be instantly withdrawn, that all reinforcements sent to South Africa since 1st June be removed, that none of the troops then on the high seas be landed in South Africa, and requiring an answer within two days. As it was out of the question for Britain to concede these demands, the Boer ultimatum was virtually a declaration of war, and on the 11th the Boer forces invaded Natal and the burghers of both republics were called out for service. From the state of their preparations, the number and quality of their guns and rifles, and the enormous quantity of ammunition and other stores, it was seen that the republics had been secretly preparing for war for years. On account of the distance from Britain and the difficulties of transport the Boers had considerable successes at first, especially in Natal, where they invested Ladysmith and 9000 men; but as the British forces increased till nearly 250,000 men were in the field under Lord Roberts, the tide of war turned against the Boers. Kimberley (16th February 1900), Ladysmith (28th February), and Mafeking (17th May) were relieved; Cronje was captured with 4000 men at Paardeberg (27th February); Bloemfontein (13th March), Johannesburg (31st May), and Pretoria (5th June) were occupied, and the South African Republic and the Orange Free State were proclaimed British colonies. President Kruger fled to Europe, to seek in vain for European intervention. In December 1900 Lord Roberts returned home, and Lord Kitchener, left in command, counteracted the guerilla raids of the Boers by an extensive series of block-houses. In May 1902 the Boer leaders, after negotiation, accepted the British terms, and peace was signed on 31st May 1902.

The Transvaal and Orange River Colonies were governed by the British crown till resettlement permitted the concession of self-government as in Cape Colony. The Letters Patent for the constitution of responsible government in the Transvaal colony were issued in December 1906, and provided for (1) a governor with a ministry not exceeding six; (2) a legislative council of fifteen members appointed in the first instance by the governor; and (3) a legislative assembly of sixty-nine members elected on a manhood suffrage (whites only). At any time after four years the legislature was empowered to pass an act making the legislative council an elected body. In 1910 the Transvaal united with Cape Colony, Natal, and the Orange Free State to form the Union of South Africa (see SOUTH AFRICA, UNION OF). As a province of the Union the Transvaal is now under an administrator appointed for five years by the governor-general of South Africa in council, an elected Provincial Council of fifty members, and an executive committee consisting of the administrator and four persons elected according to the system of proportional representation by the Provincial Council. The Provincial Council is elected for three years by European manhood suffrage; must have at least one session every year; may be prorogued; but cannot be dissolved before the expiry of its term. Members are paid. The Provincial Council deals with local matters delegated to it by the Union parliament, the consent of which is required for its acts.

Stock-raising and mining are the chief industries of the Transvaal. It ranks first among the gold-producing countries of the world, the Far East Rand being the main centre of production. Coal is found near the gold-fields, and its production is rapidly increasing. There are also deposits of silver with copper and lead, platinum, iron, cobalt, and other metals and minerals. (See SOUTH AFRICA, *Mining*). Large numbers of sheep, cattle, and goats are reared. The cultivated crops are mainly maize, tobacco, and fruit, with some cotton. Manufacturing industries are being developed. At the census of 1921 the population was 2,087,636, of whom 543,485 were whites and 1,544,151 coloured people, including Kaffirs and Indian and Chinese coolies. The Boers belong to the several divisions of the Dutch Reformed Church. Much money and attention has been devoted in recent years to educational development, and the province has a good system of primary and secondary schools. The University of Witwatersrand was incorporated in 1922, while Potchefstroom University College and Transvaal University College (Pretoria) are constituent colleges of the University of South Africa. The natural seaports for the Transvaal are Delagoa Bay and Durban; and from them and the Cape ports lines of railway extend to Johannesburg and Pretoria (since 1892–95). Pretoria (white pop. 54,121) is the seat of provincial government, and of the executive of the Union.

See J. Nixon, *The Complete Story of the Transvaal* (1885); Mather, *Golden South Africa* (new ed. 1889); C. J. Alford, *Geological Features of the Transvaal* (1891); W. L. Distant, *A Naturalist in the Transvaal* (1892); Hatch and Chalmers, *The Gold-mines of the Rand* (1895); H. Cloete, *History of the Great Boer Trek* (1899); W. D. Mackenzie, *South Africa: Its History, Heroes, and Wars* (1900); G. M. Theal, *History of South Africa* (5 vols. 1908 edition). See also B. Worsfold's book on Lord Milner; and the books quoted at SOUTH AFRICA. The war of 1899–1902 produced a large literature, including the *Official History* (4 vols. 1906–10) and the *Times* history, that by Sir F. H. E. Cunliffe, Fitzpatrick's *Transvaal from Within* (hostile to the Boers), Voigt's *Fifty Years of the Republic in South Africa* (hostile to Britain), Sir Conan Doyle's *Great Boer War*, Kruger's *Memoirs* (1902), De Wet's *Three Years' War* (1903).

Transylvania, till 1918–20 the easternmost part of Hungary, now part of Rumania, is mainly a plateau surrounded and crossed by mountain-chains, and drained by tributaries of the Theiss and the Danube. Of the population (about 2,700,000) some 55 per cent. are cattle-breeding Rumanians or Wallachians of the Greek Church. The Hungarians number about 30 per cent., farmers and Roman Catholic or Unitarians (the Szeklers retain many characteristics of the old Magyars). The Germans or Saxons, 9 per cent., live in the south, where they farm and grow fruit and wine; they are mostly Protestant. Other peoples include Jews, Greeks, Armenians, Slavs, and some 50,000 Gypsies. Klausenburg (Cluj, Kolozsvár), Kronstadt (Brassó, Braşo), and Hermannstadt (Sibiu, Nagy-Szeben) are the principal towns. Transylvania is important both for its agriculture and its industry. The forests, 5½ million acres in area, include much valuable oak timber. The arable land is devoted chiefly to forage crops, cereals, grasses, fruits, vines, tobacco, flax, and hemp. Cattle, buffaloes, horses, and sheep are widely bred. Transylvania, which was previously a land of large Magyar landholders, was much affected by the agrarian reforms (see RUMANIA). The industries include flour-milling and brewing and the manufacture of leather, chemicals, woollens, soap, and candles. The

chief minerals are salt (a state monopoly), gold, natural gas, silver, copper, lead, iron, and some coal; there are also abundant mineral springs. Transylvania, the Roman Dacia (q.v.), was successively overrun by Ostrogoths, Gepidæ, Petchenegs, and Magyars (11th century). The 13th century brought German colonists to mix with Romano-Dacians and Magyars (Szeklers). From the land being divided into seven administrative divisions it acquired the name of *Siebenbürgen*—the Seven Strong Towns. In the 16th century the woiwode of Transylvania, John Zapolya (see HUNGARY), asserted his independence of the emperor; and till the end of the 16th century the princes of Transylvania even regarded the sultan as their suzerain. During the first half of the 19th century the Hungarian elements of the population strove to promote a closer union with Hungary, and at the same time stoutly asserted the ancient rights of which the people of Transylvania (except the Rumanians) had been gradually deprived by the imperial governors. The Rumanians, too, petitioned very earnestly for the same political rights as the Magyars, Szeklers, and Saxons enjoyed. These various conflicting claims resulted in 1848 in a fierce racial war, in which General Bem, acting in conjunction with the Hungarians, for some time successfully withstood the forces of the emperor (the Austrians), the Russians, and the Rumanian levies. After hostilities had ceased in 1849 Transylvania was made a crown-land of the Austrian empire, its ancient rights being restored to it eleven years later. But in 1867–68 the Hungarian party effected the complete union of the country with Hungary, and from that time it was 'Magyarised' apace. Transylvania declared its independence of Hungary 2d December 1918, and on 11th January 1919 was annexed by Rumania. The Paris Conference insisted on the protection of minorities, linguistic and religious, provision for which by treaty was hotly resented by Rumania and disregarded in practice. Transylvania (with the Banat, Crisana, and Maramuresh) is divided into 22 administrative districts under prefects, and sends 112 deputies and 45 senators to Bucharest.

See E. Gerard, *The Land beyond the Forest* (1888); C. Boner, *Transylvania* (1865); Josef Haltrich, *Zur Volkskunde der Siebenbürger Sachsen* (ed. J. Wolf, Vienna, 1885); Fr. Müller, Haltrich, and Fr. Fronius, *Siebenbürgisch-Deutsche Volksbücher* (3 vols. 1885); N. Iorga, *Histoire des Romains de Transylvanie et de Hongrie* (Bukarest, 1914); Zsombor de Szász, *Minorities in Roumanian Transylvania* (1927).

Trap (Sw. *trappa*, 'a stair'), an old-fashioned word for various crystalline Igneous Rocks (q.v.), mostly basic, often arranged in approximately horizontal beds, separated by layers of some more yielding material, such as tuff, shale, sandstone. Under the influence of denudation the relatively hard crystalline rocks come to stand out like huge steps on hill-faces and mountain-slopes. Most of the trap-rocks are varieties of Basalt (q.v.), but under the same head were included many other modern rock types.

Trapa, a genus of plants of the Hydrocaryaceæ, and named from the resemblance of the fruit to a Caltrop (q.v.; Low Lat. *calcitrapa*). The genus comprises only two or three species, all aquatic and natives of central and southern Europe, India, China, Japan, and Africa. The seeds of all abound in starch, and are much used for food. The most familiar is the *T. natans*, or Water Chestnut. *T. bispinosa*, the Singhara Nut, affords a great part of the food of the inhabitants of Kashmir.

Trapani (anc. *Drepănum*), a seaport of Sicily, and capital of a province in the north-west of the island, stands on a tongue of land 40 miles W. of Palermo, but fully thrice (141 m.) that distance by rail. It has a trade in wheat, wine, olives, sumach, salt, tunny fish, sponges, and coral. It has a number of interesting baroque buildings, as well as some older remains. Since 1860 it has been transformed: most of its fortifications have been removed to make room for promenades, gardens, new streets, and monuments; a suburb (the Borgo Annunziata, where, close to the church of that name, is the town museum, founded by Conte Pepoli) 2 miles long has been built; and the place is now noticeably clean, and plentifully supplied (since 1891) with good water brought 60 miles. The musician A. Scarlatti and the astronomer L. Ximenes were born here. The ancient *Drepanum* took its name from the low, sickle-shaped promontory on which it stood. It was probably founded by the Carthaginians, who in 260 B.C. transported here some of the inhabitants of Eryx (q.v.), which rose on the lofty mountain (Monte S. Giuliano) to the north-east of the town; and here they utterly defeated the Romans in a celebrated naval engagement in 249 B.C. Pop. (commune, 1921) 71,174.

Trapezium. Euclid defined a trapezium as any quadrilateral except a square, an oblong, a rhombus, and a rhomboid. Later Greek geometers seem to have used the word in the more restricted sense of a quadrilateral with one pair of parallel sides; and the word trapezoid was introduced to describe a quadrilateral which had no two sides parallel. On the Continent the words are so distinguished to this day. By English geometers and writers on mensuration the words got interchanged as regards their significance, so that with us a trapezoid is generally defined as a quadrilateral with two parallel sides. Thus English writers have retained trapezium in the broader sense, and have used trapezoid in the restricted sense of a Euclidean trapezium with two sides parallel. The continental custom is historically and etymologically the better. There is, however, hardly a necessity for both words, since the word quadrilateral is now invariably used by modern geometers for a four-sided figure which is not a parallelogram.

Trappists, a religious order, celebrated for its extraordinary austerities, is so called from an abbey of the Cistercian order, founded in the middle of the 12th century, in the narrow valley of La Trappe, near Mortagne, in the Norman department of Orne—called 'the trap' because of its inaccessibility. The discipline of this monastery, in common with many others of the more wealthy monastic bodies, especially of those which were held *in commendam*, had become very much relaxed. In the first half of the 17th century the abbey of La Trappe fell, with other ecclesiastical preferments, to Dominique Armand-Jean le Bouthillier de Rancé (1626–1700), originally an accomplished but worldly courtier, who suddenly underwent a great change and turned his back on the vanities of the world. He undertook a reform of his monastery, and in the end established what was equivalent to a new religious order. It was in 1662 that he commenced his reforms. At first he encountered violent opposition from the brethren; but his firmness overcame it all. He himself entered upon a fresh novitiate in 1663, made anew the solemn profession, and was reinstalled as abbot. From this time may be dated the introduction of the new austerities which characterised the order. The monks were forbidden the use of meat, fish, wine, and eggs. All intercourse with externs was cut off, and the old monastic habit of manual labour was revived. The reform of De Rancé is founded on the principle of perpetual prayer and entire self-abnegation. By the Trappist rule the

monks are obliged to rise at two o'clock A.M. for matins in the church, which last till half-past three; and after an interval occupied in private devotion they go at half-past five to the office of prime, which is followed by a lecture. At seven they engage in their several daily tasks, indoors or out, according to the weather. At half-past nine they return to the choir for the successive offices of terce, sext, and none; at the close of which they dine on vegetables dressed without butter or oil, or on vegetable soup, and a little fruit. Milk and cheese are used save in time of fast; the sick are allowed eggs. The dietary is not the same in all the houses of the order. In some light beer or wine is sparingly allowed. The principal meal is succeeded by manual labour for two hours, after which each monk occupies an hour in private prayer or reading in his own cell until four o'clock, when they again assemble in the choir for vespers. The supper consists of bread and water, and after a short interval of repose is followed by a lecture. At six o'clock they recite compline in choir, and at the end spend half an hour in meditation, retiring to rest at eight o'clock. The bed is a hard straw mattress, with a coarse coverlet; and the Trappist never lays aside his habit, even in case of sickness, unless it should prove extreme. Perpetual silence is prescribed, save in cases of necessity, and at certain stated times; only the abbot and the guest-master are allowed to speak to strangers. But conversation by means of manual and other signs is practised. The minor practices and observances are devised so as to remind the monk at every turn of the shortness of life and the rigour of judgment; and the last scene of life is made signal in its austerity by the dying man being laid during his death-agony upon a few handfuls of straw, that he may, as it were, lay aside upon the very brink of the grave even the last fragment of earthly comfort to which the necessities of nature had till then compelled him to cling.

The reformed order of La Trappe scarcely extended beyond France in the first period of its institution. The inmates of La Trappe shared, at the Revolution, the common fate of all the religious houses of France: they were compelled to quit their monastery; but a considerable number of them found a shelter at Valsainte, in the canton of Fribourg in Switzerland. In the vicissitudes of the revolutionary war they were driven from this house; and a community numbering about 250, together with a large number of nuns who had been established for purposes of education, found refuge at Constance, at Augsburg, at Munich, and even in Russia. Later in the course of the war small communities obtained a certain footing in Italy, Spain, America, England, and, notwithstanding the prohibitory law, even in France, at Mont Genèvre. After the Restoration they resumed, by purchase (1817), possession of their old home at La Trappe, which continued to be the head monastery of the order. During the course of the next fifty years they formed many establishments in France, the house of La Meilleraye being one of the most famous abbeys. Congregations were also founded in Belgium and Italy, and in 1892 the order was reorganised as the 'Order of Reformed Cistercians,' its headquarters being established at the old abbey of Cîteaux, which came into its possession in 1898. The order now has over seventy houses scattered throughout the world. In England the Cistercian house of St Bernard in Leicestershire is Trappist; so is the convent at Stapehill in Dorset. In Ireland the order has houses at Mount Melleray, near Cappoquin, in Waterford, and at Roscrea in Tipperary. There are also houses in America, Canada, China, Japan, and Africa.

See works quoted at MONACHISM; Gaillardin's *Trappistes; ou l'Ordre de Cîteaux au 19me Siècle* (1844); Pfannenschmidt, *Geschichte der Trappisten* (1873); Comte de Charency, *Cartulaire de l'Abbaye de Notre Dame de La Trappe* (1891); M. Heimbucher, *Orden und Kongregationen*, vol. i. (1907); and for life in a Trappist monastery, Huysman's *En Route* (trans. 1896).

Traprain, or DUNPENDER, a phonolite neck in East Lothian, overlooking the Tyne opposite East Linton. It is associated with the story of St Kentigern's mother, St Thenaw (see KENTIGERN). In 1919 it became more famous by the finding of treasure trove, consisting of Roman silver plate (bowls, spoons, plates, &c.), Roman coins and pottery; and of relics of native manufacture, mostly bronze (weapons, tools, harness, &c.), but also including glass, brooches, beads, &c.; there is also evidence of earlier occupations, axes, burial urns, and moulds, dating from the Bronze Age. The site of Traprain was certainly occupied by a native fortified town during the first four centuries A.D., and it is supposed that the silver plate—late Roman in date, and (in part) Christian in design—was looted from some religious house on the Continent and buried here by Teutonic invaders. See A. O. Curle, *Treasure of Traprain* (1923).

Trasimene Lake, a shallow Italian lake lying between the towns of Cortona and Perugia. Surrounded on all sides by hills, it is about 14 miles in length by 8 in breadth. It contains three islands and is full of fish. The flat and reedy margins were of late planted with eucalyptus trees. In 1898 a new canal was completed (close to the old one near the south-east corner) to regulate and partially drain the lake, which is memorable for the great victory obtained by Hannibal (q.v.) in 217 B.C. over the Romans on the north bank.

Tras-os-Montes. See TRAZ-OS-MONTES.

Trass. See TUFF.

Traun See. See GMUNDEN.

Traunstein, a summer resort of SE. Bavaria on the river Traun, has saline springs; pop. 7000.

Trautenau (Czech, *Trutnov*), a town of Czechoslovakia, 120 miles NE. of Prague, has an ancient church (1283) and important manufactures, especially linen; pop. (1921) 14,584.

Travancore (*Tiruvánkod*), a state in the extreme south of India, bounded on the N. by Cochin, on the E. by British territory, and on the W. by the Indian Ocean. The state pays a yearly tribute of 8 lakhs of rupees to the British government, and is politically connected with the presidency of Madras. Area, 7625 sq. m.; pop. (1881) 2,401,158; (1921) 4,006,062, two-thirds Hindus. Nairs are over a sixth of the total, Mohammedans about 7 per cent. Christians number 1,172,934, more than half of whom belong to the Syrian churches (see THOMAS, CHRISTIANS OF ST). There are some black Jews. At the southern extremity of the state is Cape Comorin; the Western Ghâts run along the eastern side. The physical appearance of the higher part of the country, which is varied and picturesque, is described at GHÂTS. Westward of the hill-foots is a level belt, 10 miles wide, covered with coconut and areca palms. On the elevations the soil is light and gravelly; in the valleys it is in general a deep black mould. The lagoons or backwaters along the coast, which Travancore shares with Cochin, are explained at COCHIN. The chief produce is copra, coir, tobacco, nut-oil, areca-nut, ginger, pepper, cardamoms, beeswax, coffee, and timber. The rajas are intelligent, have been faithful to the English alliance, cherish education, and govern well. The capital is Trivandrum; other principal places are Aulapolai, Nagercoil, and Quilon. See Mateer, *Native Life in Travancore* (1883).

Travellers. See Commercial Travellers, Carriers, Inn.

Traveller's Joy. See Clematis.

Traveller's Tree (*Ravenala madagascariensis*, or *Urania speciosa*), a remarkable plant of the family Musaceæ, a native of Madagascar, forming a characteristic feature of the scenery of many parts of that island. The stem sends out leaves only on two opposite sides, like a great expanded fan. The lower leaves drop off as the stem grows, and in an old tree the lowest leaves are sometimes 30 feet from the ground. A tree

Traveller's Tree (*Ravenala madagascariensis*).

often has twenty or twenty-four leaves, the stalk of each leaf being 6 or 8 feet long, and the blade 4 or 6 feet more. The blade of the leaf is oblong, bright green, and shining. The fruit is woody, capsular, three-celled, the seeds are arranged in two rows in each cell, and are surrounded by a pulpy blue aril. Forty or fifty fruits grow in a bunch, and three or four bunches may be seen at once on the tree. The leaves are much used for thatch, and for many other purposes, and the leaf-stalks for the partitions, and often even for the walls of houses. It received its popular name, *Arbre des voyageurs*, first from the French on account of the stores of more or less potable water found in the large cup-like sheaths of its leaf-stalks, and obtained by tapping the sheaths at the base. There is a similar tree, *R. guianensis*, in South America.

Travemünde. See Lübeck.

Traverse City, the capital of Grand Traverse county, Michigan, U.S.A., 150 miles N. of Grand Rapids, has numerous manufactures connected with lumbering, also flour-mills and a state hospital; pop. 11,000.

Travertin, the Italian name for limestone formed by springs holding lime in solution. See Calcareous Tufa.

Travnik, a town of Bosnia, once its capital, stands on the Lasva River, 45 miles NW. of Sarajevo by rail. The administrative department of Travnik has a population of 280,000.

Trawling. See Fisheries.

Traz-os-Montes ('Beyond the Mountains'), a province forming the north-east corner of Portugal, bordering on Spain and bounded S. by the Douro, now falls into the two districts of Braganza and Villa Real, with a collective area of 4160 sq. m., and a population of 400,000. It is a coldish plateau, with bare mountain masses, broken through by deep romantic ravines; but the wine district known as the *Alto-Douro* is fertile. Wine is the chief product, but the mountains are also rich in unutilised metallic wealth.

Treacle, the dark, viscous, uncrystallisable syrup obtained in refining sugar; also the drainings of crude sugar, properly distinguished from treacle as molasses. See Sugar, Syrup. The word *treacle* is a corruption of *theriacal* (from *theriaca*) and originally meant an electuary, or compound syrupy medicine; it was applied to molasses from the similarity of appearance. Theriaca, supposed to be an antidote to the poison of venomous animals, is said to have been invented by Andromachus of Crete, physician to the Emperor Nero.

Treacle Mustard. See Erysimum.

Tread-wheel, an apparatus formerly used in prisons in Britain for enforcing a portion of the sentences of imprisonment with hard labour. Sir W. Cubitt about 1818 devised its construction. The Prison Act, 1865, required that every male adult prisoner over sixteen years of age sentenced to hard labour should during at least three months of his sentence be employed on labour of the first class—crank, capstan, tread-wheel, stone-breaking, or other like kind of bodily labour. The minimum period was by the Prison Act, 1877, reduced to one month.

The tread-wheel consisted of a hollow cylinder of wood on an iron frame, and revolving on an iron axle. The cylinder, usually about 5 to 6 feet in diameter, had on its outer circumference steps about 7½ inches apart. The weight of the prisoners coming on these steps in succession caused the wheel to revolve. By means of suitable gearing this power was transferred and utilised for grinding corn, pumping water, and other purposes. The speed of the wheel was regulated by some sort of brake applied by means of a 'governor.' Prisoners were kept at this work for 6 hours in each day, divided into two periods of 3 hours each; and during each of these periods they were on the wheel for spells of 15 minutes, and then resting for 5 minutes. In order to prevent intercourse between prisoners, wooden partitions were placed so that each of them worked in a separate compartment.

The crank was sometimes substituted for the tread-wheel as a means of enforcing hard labour. It had the advantage that the prisoner could work it in his cell. The prisoner turned a handle which caused a wheel to revolve, and the resistance to be overcome was derived from a brake fitted on the wheel, or from mill machinery applied to grinding corn, pumping water, turning saws, or other purposes. Hard labour now takes other forms.

Treason may be defined in general terms as an attempt to overturn the government established by law. In early times it was regarded entirely as an offence against the monarch in whom that government was personified, and this view is still apparent in the present state of the law. The foundation of the English legislation on the subject is the Statute of Treasons (25 Ed. III. sect. 5), 1352. Previous to that the law was vague. Murder, highway robbery, piracy, even charging the king wrongfully, were sometimes punished as treason. What was termed 'accroaching'—i.e. assuming or trespassing on royal power—also fell under this designation. The Statute of Treasons was passed to declare the law on the subject. It enumerated various acts which constitute the crime. These were compassing the king or queen's death,

or that of the heir; seducing his wife or eldest daughter, or the wife of his heir; levying war against the king, or assisting his enemies; killing the judges whilst in the execution of their duty. A later age found this, as other mediæval acts, alike redundant and defective. There has never been any prosecution under some of its provisions, and many varieties of attacks on the state or its ruler did not come within its plain meaning. The judges gave a forced construction to the clauses, and thus widened their application; yet there was much fresh legislation. Under Henry VII. (1494) it was enacted that obedience to the king *de facto* but not *de jure* was not treason. Under Henry VIII. there were nine acts passed creating fresh treasons, but these were all swept away in the first year of his successor. Again, acts on the subject were passed under the Stuarts, and were in turn superseded by laws passed after the Revolution.

The provisions of the Statute of Treasons above mentioned still remain in force. It is to be noted that the offence consists in *imagining* the sovereign's death, and that it is proved by such overt acts as display the intention. As to levying war, this includes an attempt by force 'to compel the sovereign to change his measures or counsels, or to intimidate or overawe both Houses or either House of Parliament,' or an attempt 'by an insurrection of any kind to effect any general public object,' as, for instance, to pull down dissenting meeting-houses generally. Although the speaking of words expressing and imagining the king's death is not of itself an overt act, yet if written or accompanied by words of advice or command they constitute such an act. In treason every accessory is a principal traitor.

An act of 1848 provides a maximum punishment of penal servitude for life for those who shall be guilty of the treason felony of attempting to deprive the sovereign of any of his dominions, or of making war against him. Insulting the sovereign, attempting to seduce soldiers, illegal drilling, and assisting at royal marriages to which the sovereign has not given consent are offences akin to treason. Offences against the state are called *high*-treason. It is distinguished from *petty*-treason—the murder of a husband by his wife, a master by his servant, or an ecclesiastical superior by his inferior. These crimes, once dealt with in many respects like those for the graver offence, are now treated as other murders; and the term petty-treason was abolished in 1828. Misprision of treason is knowledge of the principal crime and concealment thereof. It is still punishable with forfeiture of goods as well as imprisonment for life. Sedition (q.v.) is cognate to treason; Coining (q.v.) used to be dealt with as treason. See also PRÆMUNIRE.

The punishment for high-treason has always been death. In its old savage form, first inflicted in 1284 on the Welsh prince David as on Sir William Wallace a few years later, and in force till 1870, the sentence provided that the criminal should be drawn on a hurdle to the place of execution, be hanged but not till he is dead, be cut down and have his entrails torn out and burned before his eyes, and then be beheaded and quartered, his remains to be disposed of as the king should think fit (see DRAWING AND QUARTERING). That sentence was last passed (though not carried out) in 1867 on the Fenians Burke and O'Brien. Women were burned alive, though the sentence might be commuted by the king to beheading, as in the case of Lady Alicia Lisle (q.v.). The punishment is now execution by hanging. The Act of 1870 prevented forfeiture of property on conviction for treason.

After the Union (1707) an act was passed making the Scots law of treason the same as the English. Thus the prosecution is not at the instance of the Lord Advocate but on the presentment of a grand jury, and there is a petty jury of twelve who determine the guilt or innocence of the prisoner. The traitor's property is still forfeited, as the Act of 1870 does not apply to Scotland.

In the United States treason is confined to levying war against the state, or adhering to and giving aid and comfort to its enemies; it implies the assembling of a body of men for the purpose of overturning or resisting the government by force.

Treasure-trove (Norman or Old French, *tresor trove*, 'treasure found') is the equivalent of the Latin phrase of the earlier law-books, *Thesaurus inventus*, and is used to denote that particular kind of treasure which, when found ownerless, becomes by the law of England the property of the crown. It is defined by Coke as follows: 'Treasure trove is when any gold or silver, in coin, plate, or bullyon, that hath been of ancient time hidden, whereso-ever it be found, whereof no person can prove any property, it doth belong to the King, or to some lord or other by the King's grant or prescription.' This is the definition adopted by the Museums Committee (1898) and cited by the Attorney-general in the case before the High Court (1903) in which the question to be decided was whether the trustees of the British Museum were in legal possession of a hoard of gold ornaments which had been ploughed up (in 1896) at Limavady in Ireland, and sold to the trustees for £600 by a collector who had acquired them from the finders; or whether the articles in question were treasure-trove, and consequently the property of the crown. The case was decided against the trustees, and the articles were subsequently gifted by the King to the Irish National Museum in Dublin. It is settled law in England that unless the ownerless treasure be of gold or silver, and can be shown to have been hidden, it is not treasure-trove. Evidence of hiding may be inferred from the circumstances of the deposit. The administration of the law of treasure-trove is under the direction of the Treasury, but in England the coroners have statutory jurisdiction, on information of the discovery of treasure, to hold an inquest and obtain a verdict of a jury on the facts of the case, and 'who are the finders, or who may be suspected thereof,' the concealment or illegal retention of treasure-trove being a criminal charge punishable by fine or imprisonment. In the case against Thomas and Willett (1863), who bought from the finder at less than the price of old brass a hoard of gold articles weighing about 11 lb., ploughed up in Sussex, and sold them to a gold-refiner by whom they were melted down, the court imposed on each a fine of £265 (the amount they had received for the gold) and ordered them to be imprisoned till the fine was paid. The finder or possessor of treasure-trove, being bound by law to deliver it up to the authorities, has no legal claim to compensation, although, as the law is now administered, the Treasury gives remuneration as an act of grace on certain conditions. By a circular issued in 1886, with a view to encourage the notification to the authorities of such finds in England, they intimate that they will return to the finders who surrender their discoveries all the articles which are not required for national institutions, together with the antiquarian value of such as may be retained, less 20 per cent. In Ireland the law is the same, but since 1861 the Treasury has had no direct connection with its administration, the whole responsibility having been delegated to the Royal Irish Academy, which receives a parliamentary grant of £100 annually towards the acquisition of treasure-trove for the National Irish Collection of Antiquities in the Dublin Museum of Science and Art. The Academy issues notices

throughout the country that payments for such articles, higher than those which could be obtained from dealers, will be made to finders who notify their finds, and that the treasure-trove regulations protect persons who sell to the Academy against claims by the crown. In Scotland there is no statute law of treasure-trove, but the claims of the crown are based on the common-law maxim, *Quod nullius est, fit Domini Regis*, and include all descriptions of ownerless personal property. The administration is in the hands of the King's and Lord Treasurer's Remembrancer in Exchequer under the direction of the Treasury. The circular (1859) gives notice to 'finders of ancient coins, gold or silver ornaments, or other relics of antiquity in Scotland,' that on their delivery to the authorities, the actual value of the articles, if retained for the crown, will be paid to them; and in cases where they are not surrendered the procurators-fiscal are instructed to take steps for their recovery. The administration of the law is practically limited to cases in which it is desirable in the public interest to secure the preservation of important finds which might otherwise be lost, destroyed, or dispersed. In all civilised countries the questions of property arising in connection with the discovery of hidden treasure have been dealt with by law, the regulations enacted by different states differing considerably in their details, for which see Dr David Murray's *Archæological Survey of the United Kingdom* (1896).

Treasury, the central department of the British executive government. After the Norman Conquest a separate board was appointed for revenue matters on the model of the Exchequer of Normandy, and a royal treasurer (usually a churchman) appointed. The office was sometimes held along with that of Justiciar. So great was the political influence of the Lord High Treasurer that James I. in 1612 thought it prudent to put the office into commission—i.e. to entrust it to a board of Lords Commissioners; since the death of Queen Anne no Lord High Treasurer has been appointed; the office has been always in commission. Similar offices existed in Scotland and Ireland. The Treasury Board now consists of four Lords Commissioners and the 'Chancellor of the Exchequer,' an officer originally appointed to check the accounts of the Treasurer (see EXCHEQUER, CABINET). The First Lord (the lord whose name stands first in the commission) is a political officer of the highest rank; he has no departmental duties to perform, and his office is therefore usually assigned to the prime minister. Since 1806 the head of the administration had always presided over the Treasury; but in 1886 Lord Salisbury undertook the department of Foreign Affairs, the leader of the House of Commons acting as First Lord of the Treasury. The junior lords perform such duties as it may be convenient to assign to them; they are usually members of the House of Commons. The Treasury Board is now no more than a name; formal documents run in the name of 'my lords,' but the working head of the department is the Chancellor of the Exchequer, who holds under a distinct patent the office of Under-treasurer. There are two secretaries, both of whom are usually members of parliament; the Financial Secretary is specially responsible for the civil service estimates; the Parliamentary Secretary conducts correspondence relating to appointments, and acts as chief whip of the ministerial party in the House of Commons. The permanent officials of the Treasury enjoy a high reputation for ability, and the traditions of the office are not to be disregarded even by the most enterprising Chancellor of the Exchequer. When the First Lord of the Treasury is himself Chancellor of the Exchequer he receives only half the salary of the latter office.

Since the Restoration it has been the established practice to keep the receipt of revenue separate from the expenditure of public money; but the Treasury exercises a general control. By an arrangement sanctioned by parliament in 1834, all public revenue is paid into the Bank of England to the credit of the Comptroller-general; this officer is in fact the pivot of the whole system; he checks all receipts and payments, and reports independently to the House of Commons. Estimates of expenditure in all the public departments are submitted to and revised by the Chancellor of the Exchequer, who is thus enabled to take a comprehensive survey of the resources and liabilities of the nation. Towards the end of the financial year he opens his budget in committee of the House of Commons, estimates the total expenditure of the coming year, and indicates the ways and means by which the required sum may be raised. Payments on account of the army, navy, civil-service, &c. are made by the Paymaster-general on the authority of the Treasury. Under various statutes the Treasury regulates the salaries of newly-created officers in other departments, and fixes the number of officers employed in new departments. The duties of the Treasury also comprise the examination of the expenses of legal establishments, sheriffs, county courts, and criminal prosecutions. The Solicitor to the Treasury is a permanent official of great importance; his office is now combined with that of King's Proctor. For a full account of the law relating to this subject, see Todd's *Parliamentary Government in England.* See CROWN.

Treaty, in Public International Law, is an agreement or contract between two or more separate states. In practice the word treaty is commonly used for the larger political or commercial contracts, the term convention being applied to agreements on matters of minor importance. The range of treaties extends to the whole variety of international relations. No special form is prescribed by international usage as necessary for treaties. The general practice is to embody a treaty in a formal written instrument signed by persons duly authorised on behalf of the contracting parties. When a treaty is entered into through the agency of plenipotentiaries, the authority of the plenipotentiaries is understood as conferring a right to conclude agreements subject to the ultimate decision of the governments whose representatives they are. Hence, in the absence of special agreement to the contrary, a treaty entered into and signed by plenipotentiaries is not binding until it is ratified, either expressly or tacitly, by the treaty-making power of the state. The constitution of each state determines in whom resides the power of making treaties. In monarchies it is usually vested in the sovereign, but the power or competence of the sovereign to make treaties may be subject to constitutional restrictions. In Great Britain the treaty-making power resides in the crown; but it would appear that a treaty which lays a pecuniary burden on the people, or which alters the law of the land, needs parliamentary sanction. In many states the treaty-making body is distinct from the executive. Thus under Art. 2, sec. 2, of the Constitution of the United States, the president can only ratify treaties with the consent of the senate. When by the constitution of a state it is essential to the validity of a treaty concluded by plenipotentiaries that it shall be sanctioned by a body, distinct from the executive and not necessarily having knowledge of the instructions given to the negotiators, the right of that body to refuse to ratify the treaty is well understood and recognised by other states. The senate of the United States has frequently refused to ratify treaties made by the executive, or has amended them as a condition

of ratification. A recent instance is the refusal of the senate to ratify the Treaty of Versailles, 1919, by which peace was made between the principal allied and associated powers and Germany. Article 18 of the Covenant of the League of Nations provides that every treaty or international engagement shall forthwith be registered with the Secretariat, and shall, as soon as possible, be published by it; and that no such treaty or international agreement shall be binding until so registered. The treaties registered are published periodically by the League.

A treaty, like a contract, may be brought to an end by agreement between the contracting parties that it shall no longer bind them. If a time limit for its duration is stipulated, it terminates when the fixed period has elapsed. Where the specific object of a treaty is the performance of some stipulated act to be done once for all, such as the payment of an indemnity or the cession of territory, the binding force of the treaty is extinguished so soon as the act stipulated in it has been performed. On the other hand, a treaty, purporting to regulate for an indefinite period the obligations and relations of the contracting states—e.g. an extradition treaty, an alliance, a commercial treaty—does not lose its obligatory force by the efflux of time. It is, however, recognised that such a treaty may cease to be binding if the conditions which existed at the date of its conclusion, and which formed at that date implied conditions of its obligatory force, are essentially altered. This principle is commonly known as the principle of *Rebus sic stantibus*. The difficulty lies in the application of the principle—in other words, in determining what is an essential change rendering it justifiable to disregard a treaty. The invocation by Germany of this principle as justifying the invasion of Belgium in 1914 in disregard of treaty engagements made plain the difficulty attending the application of the *Rebus sic stantibus* doctrine, and the danger of its being improperly used to hide the violation of a treaty behind the shield of law. An attempt to deal with the problem is made in Article 19 of the Covenant of the League of Nations, 1919, which provides that the Assembly of the League may from time to time advise the reconsideration by members of the League of treaties which have become inapplicable, and the consideration of international conditions whose continuance might endanger the peace of the world.

Treaties which merely settle some matter of dispute between the parties to them do not in any way affect international law. On the other hand, certain classes of treaties are a source of international law. Thus treaties concluded by a considerable number of the leading states in the world for the purpose of making changes in, or adding new provisions to, the existing law—e.g. the Declaration of Paris in 1856, the Hague Convention, the Covenant of the League of Nations—are important, as a source of international law, in proportion to the number of states which sign them or which subsequently adhere to the rules laid down in them. Another class of treaties which may properly be termed 'law-making' are those which are expressly declaratory of international law as understood by the contracting parties—e.g. the Protocol signed at the Conference of London in 1871.

Performance of the stipulations contained in a treaty used frequently to be secured by the taking of hostages. This practice is now in disuse, the Treaty of Aix-la-Chapelle in 1748 being the last occasion upon which hostages were given, except in military conventions. The occupation of territory has also often been used as a mode of taking security. Thus by the Treaty of Versailles, 1919, as a guarantee for the execution of the treaty, German territory situated to the west of the Rhine, together with the bridge-heads, was occupied for a period by allied and associated troops. States now, in the ordinary case, are content to rely on their own power, and on the good faith of nations, to secure the observance of treaties entered into with them. One of the objects of the League of Nations is, as set out in the preamble of the Covenant, 'to achieve international peace and security by a scrupulous respect for all treaty obligations.'

As regards the effect of war in annulling or suspending treaties to which the belligerents are parties—there are many treaties whose object and import are such that war will put an end to them. On the other hand there are treaties meant to remain in force in perpetuity, or dealing with the case of war as well as peace, which will survive the outbreak of war. A distinction is also to be taken between treaties to which the belligerents only are parties and treaties to which other powers besides the belligerents are parties. It is a usual practice for the parties to a treaty of peace to make special stipulations in the treaty with respect to the revival of treaties which had been cancelled or suspended by the war. This practice was followed in the treaties of peace entered into at the end of the war of 1914–18.

See Oppenheim, *International Law*, vol. i. secs. 555–568, for a summary of the more important law-making treaties; Sir E. Hertslet, *The Map of Europe by Treaty* (4 vols. London, 1875–91).

Trebbia (anc. *Trebia*), a southern tributary of the Po, which rises in the Ligurian Apennines. Here Hannibal (q.v.) decisively defeated the Roman consul Sempronius, 218 B.C., 4 miles W. of Placentia, on the left bank of the river, according to the account of Polybius.

Trebelli (1838–92), Zelia, opera-singer, was born of German parents called Gilbert at Paris, and made her début at Madrid under the name of Trebelli (? Gillebert transposed) in 1859. Subsequent triumphs in Berlin, London, Scandinavia, Russia, and the United States confirmed her reputation as the greatest mezzo-soprano of her day.

Trebizond (Old Gr. *Trapezous;* mediæval Lat. *Trebisonda;* Turk. *Tarabzún*) is the capital of a vilayet of the same name in the extreme NE. of Asia Minor. The city is a flourishing seaport on the Black Sea coast, between the sea and the mountains; its importance being due to the fact that it stands on the great overland trade-route between Europe and Persia over the tableland of Armenia, though this trade has been much injured by the Batum-Tiflis railway. It is surrounded by walls of great extent, which have many picturesque forts and enclose numerous gardens as well as the town itself. The harbour is but a roadstead, not protected on the north-east, and vessels cannot come close inshore. The pop. of the town is about 40,000. The city is noted for its silk manufactures, which, however, are fast decaying. The old Greek city is said to date from 756 B.C., and was founded by a colony from Sinope. Conquered from Mithradates by the Romans, it rapidly rose in importance, became a free city, and was made by Trajan the capital of Pontus Cappadocius. On the capture of Constantinople by the Crusaders in 1204 one of the imperial Byzantine family, Alexis, established himself at Trebizond, where he had previously exercised the functions of governor, and founded a state known as the *Empire of Trebizond*, which stretched from the Phasis to the Halys, and maintained its independence against the Turks till 1462.—George of Trebizond (1396–1486),

descended of parents from Trebizond, was born in Crete, but settled in Italy in 1420 as a teacher of rhetoric, Greek grammar, and philosophy. Trebizond was the birthplace of Johannes Bessarion (q.v.).

Treble, the highest part in harmonised music, which in general contains the melody, and is sung by a Soprano (q.v.) voice. For the treble or G clef, see CLEF.

Trede'gar, a market-town on the north-west border of Monmouthshire, 12 miles WSW. of Abergavenny and 7 ENE. of Merthyr-Tydfil. Grown from a mere village since 1800, it stands in the midst of a district rich in coal and ironstone; but its iron and steel works are a thing of the past. Pop. 20,000.

Tredgold, THOMAS, architect and engineer, was born at Brandon, near Durham, 22d August 1788. While apprenticed to a cabinet-maker, and while working as a carpenter in Scotland, he devoted his leisure time to the study of the principles of architecture and kindred subjects. A civil engineer in later life, he died 28th January 1829. Tredgold's scientific contributions to periodicals and also to the *Encyclopædia Britannica* range over a wide field; but his most valuable works are *The Elementary Principles of Carpentry* (1820) and the *Strength of Cast Iron* (1821).

Tree, any large woody plant of perennial duration, the natural habit of which is to rise from the ground with a distinct trunk, in contradistinction to Shrub, which is smaller, and may produce several stems more or less directly rising from the root. The terms are, however, somewhat arbitrary in their application. Trees are found in all climates except the coldest, but the number of species, as well as the luxuriance of the forests, is greatest in the tropics. As we advance towards the polar regions, or ascend high mountains, trees disappear before other forms of vegetation. The different characters of trees affect very much the landscape of the countries in which they grow; some countries, and particularly in northern parts of the world, being covered with sombre pine forests, whilst others abound in ash, beech, and similar trees of verdant foliage. Every kind of tree has its peculiar character, not only in its foliage, but in its general form and its mode of branching. An ash is as easily distinguished from an elm by a practised eye in winter when destitute of leaves as in the full foliage of summer. No flowerless plant assumes the character of a tree, except a few ferns known as Tree-ferns. See also ECOLOGY, FORESTRY, GARDENING, TIMBER, TRANSPLANTING, WOOD; and for tree-worship, see PLANTS.

In Law, trees and shrubs are fixtures, and on sale pass with the land to the purchaser. Except in nursery gardens, shrubs are reserved to the landlord. Even a lease of land with woods gives only the right of thinning plantations, cutting copsewood, and of cutting wood for repairing or building houses upon the ground, but not of selling wood. Injuries to trees are punishable at common law as malicious mischief.

Tree, SIR HERBERT BEERBOHM, actor, was born 17th December 1853 in London, and definitely established his reputation in 1876 by his representation of the curate in *The Private Secretary*. In 1887 he undertook the management of the Haymarket Theatre, removing ten years later to Her Majesty's Theatre. His splendid versatility, helped by his aptitude for the technique of stage-production, brought him success in many rôles, but he is specially remembered in connection with his revivals of Shakespeare. He was knighted in 1909, and died in London 2d July 1917. A collection of *Memoirs* was edited by his brother, Max Beerbohm, in 1920.

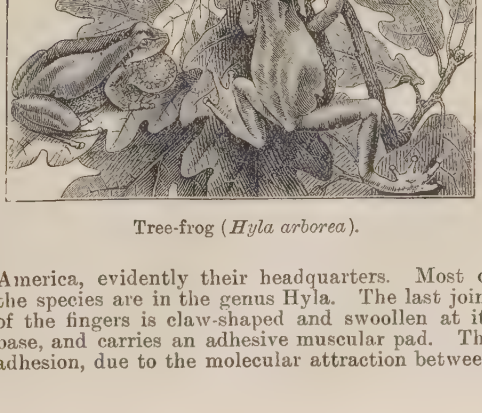
Tree-creeper, a common name for *Certhia familiaris*. See CREEPER.

Tree-fern, the common name for ferns with arborescent trunks, of which there are many species, all natives of tropical and subtropical countries. Their stems are formed of the consolidated bases of the fronds, surrounding a central column of soft tissue, in which the circulation takes place. In the landscape their columnar trunks, surmounted by graceful crowns of spreading fronds, have a similar

Tree-fern (*Cyathea dealbata*).

effect to the palms. The height to which they attain varies from 2 or 3 feet to 80 feet, according to the species. The Alsophilas and Cyatheas are the giants of the tribe. *A. excelsa*, a native of Norfolk Island, is stated by Captain King to grow to the height of 80 feet. The pith or soft cellular matter in the centre of the stem of *A. excelsa* and *A. medullaris*, the latter a native of New Zealand, is greedily eaten by swine, and when cooked resembles inferior turnips in taste and texture. Numerous species of tree-fern are cultivated in British conservatories.

Tree-frog (*Hylidæ*), a family of arboreal Amphibians, nearer toads than frogs, including about 150 species, all American and Australian except the Old World *Hyla arborea* and two closely allied forms. Half of the species occur in South



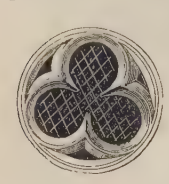
Tree-frog (*Hyla arborea*).

America, evidently their headquarters. Most of the species are in the genus Hyla. The last joint of the fingers is claw-shaped and swoollen at its base, and carries an adhesive muscular pad. The adhesion, due to the molecular attraction between

pad and branch, is helped by a sticky secretion. The colour of tree-frogs is often green and often changeable; the voice is often loud and enhanced by resonating sacs; the food consists of insects. The tree-frogs show many different ways of dealing with the eggs; e.g. in a mud-nest, in a leaf-nest (Phyllomedusa), in a brood-pouch (Nototrema). The name tree-frog is often extended to arboreal Amphibians with adhesive disks, e.g. Hylodes, which are not, however, referable to the family Hylidæ.

Tree-nettle. See NETTLE-TREE.

Trefoil, a name given to many herbaceous plants with leaves of three leaflets, as Clover (q.v.), Lotus (q.v.), Medick (q.v.), Buck-bean (q.v.), &c. The term is used also in Architecture (for a three-lobed aperture in tracery) and in Heraldry.



Trefoil in Architecture.

Tregelles, SAMUEL PRIDEAUX, New Testament critic, was born of Quaker parentage at Falmouth, 30th January 1813. After some years as a private teacher, he gave himself to the study of the New Testament text, and at twenty-five formed the plan of a Greek New Testament on the principles which he afterwards carried out. In search of MSS., he spent five months in Rome, where he was allowed to see, but not to collate, the *Codex Vaticanus*. The first part appeared in 1857; the sixth, completing the text, in 1872. The seventh part, containing the *prolegomena*, appeared in 1879, edited by Dr Hort and A. W. Streane. Other works of his were the *Codex Zacynthius* (1861), and *Canon Muratorianus* (1868); an *Account of the Printed Text of the Greek New Testament* (1854), and *Remarks on the Prophetic Visions of Daniel* (1847). Besides these he edited *The Englishman's Greek Concordance*, and *The Englishman's Hebrew Concordance*, and translated Gesenius's *Hebrew Lexicon* (1847). In 1861 and again in 1870 he was stricken by paralysis; yet, aided by a pension from the civil list, he persevered in his labours with a noble fortitude. He died on the 24th of April 1875.

Tréguier, a small port of 2500 inhabitants in the department of Côtes-du-Nord, Brittany, the birthplace of Renan.

Treinta y Tres, an eastern department of Uruguay (q.v.), washed by the Lagoa Mirim. The name was given to commemorate the *thirty and three* patriots who on 19th April 1825, after revolutionary meetings in Buenos Aires, crossed the Plate and proclaimed a revolt against Brazil.

Treitschke, HEINRICH VON, a distinguished writer on German politics and history, was born 15th September 1834 at Dresden, the son of an army officer of high rank. After studying at Leipzig and Bonn and lecturing at Leipzig on history and politics, he became a professor at Freiburg (1863). But three years later he threw in his lot with Prussia, and obtained appointments at Kiel, Heidelberg, and eventually Berlin (1874). There Treitschke was a figure of great eminence. He wielded a powerful influence as champion of the Hohenzollern cause and a colonial policy, but was restricted in his activities as a member of the Reichstag by his chronic deafness. He died 28th April 1896. His literary activities were manifold. He edited for a long period the *Preussische Jahrbücher* and, after Sybel, the *Historische Zeitschrift*, but his chief production was his *Deutsche Geschichte im 19. Jahrhundert* (5 vols. 1879–94), which, however, barely covers the first half of the century. There are several collections of his political essays—*Historische und politische Aufsätze, Zehn Jahre deutscher Kämpfe, Politik*—and two volumes of patriotic verse. His *History* shows deep and careful scholarship but is markedly biassed. There is an English translation of it by E. and C. Paul (1915–18) and of the *Politik* by B. Dugdale and Torben de Bille (2 vols. 1916). See also the English translation of Adolf Hausrath's *Treitschke: His Life and Works* (1914), and H. W. C. Davis, *Political Thought of Treitschke* (1914).

Trelawny, EDWARD JOHN, a venturesome Cornishman, whose name is strangely linked with the names of Shelley and Byron, sprang from a famous and ancient family, was born in 1792, and entered the navy at eleven. Harsh treatment, together with a native spirit of insubordination, made him desert, and he is said next to have joined a privateer, and to have lived a life of desperate enterprises in the Indian and Malay Seas. In January 1822 he made the acquaintance of Shelley at Pisa, and it was he who took the chief part in the burning of the poet's body in August on the shore near Via Reggio. Next year he accompanied Byron to Greece, and there remained some time after Byron's death, attached to the fortunes of the chief Odysseus, who came to be more or less in open opposition to the government. Once while Trelawny was sheltering in the cave of Odysseus a treacherous Englishman shattered his jaw with a bullet; but he, with characteristic magnanimity, and though himself expecting death, saved the wretch from the vengeance of his men and sent him away in safety. The wanderer next travelled in North and South America, lived awhile in Italy, and spent his last years in Monmouthshire or Sussex, dying in his home at Sompting near Worthing, 13th August 1881. His body was cremated, and the ashes carried to Rome and laid beside the graves of Shelley and Keats. Trelawny was a man of indomitable courage and generous to a fault, but restless, impatient, and completely impracticable. He had scarcely ever had an illness, to the last wore neither overcoat nor underclothing, took scarce any animal food, and was abstemious throughout his life. Remarkably handsome in youth, in old age his presence was no less striking. He was the old Arctic voyager in Millais's 'North-west Passage.' Trelawny published two books, *The Adventures of a Younger Son* (1830; new ed. 1890), a vivid though ill-constructed story, based on the adventures of his own youth; and *Recollections of the Last Days of Shelley and Byron* (1858), re-issued in 1878 with considerable changes as *Records of Shelley, Byron, and the Author*. The importance of the latter is of course almost altogether relative; it reveals considerable power of insight into character, and betrays, as might have been expected, much greater sympathy for Shelley than for Byron. See his *Letters* (1911).

Trelawny, SIR JONATHAN, from Westminster passed in 1663 to Christ Church, Oxford, and became bishop in turn of Bristol (1685), Exeter (1688), and Winchester (1707); he was one of the Seven Bishops (q.v.) tried under James II., and is the hero of R. S. Hawker's well-known ballad, 'And shall Trelawny die?' This was based on a contemporary refrain, the strong feeling aroused among the Cornishmen due rather to Trelawny's being head of an ancient Cornish house than to his being a bishop or even a martyr in a good cause. Trelawny died in 1721.

Tremad'oc Slates. See CAMBRIAN SYSTEM.

Trematodes, a class of parasitic flat-worms, related to Planarians (q.v.) and Tapeworms (q.v.). The body is unsegmented, usually leaf-like, provided with adhesive suckers. Many are ecto-parasitic, and most of these have but one host ('monogenetic'), e.g. Gyrodactylus on sticklebacks,

Diplozoon on minnows. Common on the gills of tadpoles and in the bladder of the frog is *Polystomum integerrimum*. Many are endoparasitic and require two hosts ('digenetic'), e.g. the Liver-fluke (see FLUKE), which has its young stages in a water-snail, and the adult usually in the sheep. Almost all Trematodes are hermaphrodites; Bilharzia (q.v.) and a few others are bisexual.

Tremella, a genus of Fungi, of the division Hymenomycetes, soft and gelatinous, mostly growing on decaying wood. In some places they receive such popular names as Witches' Meat, and an imaginary medicinal value has been ascribed to them.

Tremolite, one of the amphibole group of minerals. It is composed of silicate of magnesium and calcium, and has a hardness of 5·5 to 6, and a specific gravity of 2·9 to 3. It occurs usually in long prisms, white or gray, vitreous, and translucent to opaque, but frequently appears as fibrous asbestos-like aggregates with a silky lustre. Tremolite is usually associated with crystalline schistose rocks, often occurring in the granular limestones, and sometimes forming the chief material of the so-called tremolite-schists.

Trench. See FORTIFICATION, SIEGE.

Trench, FREDERICK HERBERT, poet and dramatist, was born at Avoncore in County Cork, 12th November 1865, and educated at Haileybury College and at Keble College, Oxford. He was widely travelled, and from 1891 to 1908 was examiner with the Board of Education. In 1908 he undertook the control of the Haymarket Theatre, and staged *King Lear*, *The Blue Bird*, &c. His chief poetical works are *Deirdre Wed* (1901), *New Poems*, including 'Apollo and the Seaman' (1907), *Ode from Italy in time of War* (1915). *Poems with Fables in Prose* (1917). His plays include *Napoleon* (1918). He died 11th June 1923. His collected works were edited by H. Williams in 1924. See a work in French by Abel Chevalley (Paris, 1925).

Trench, RICHARD CHENEVIX, Archbishop of Dublin, belonged to an Anglo-Irish family of Galway, the Trenches of Woodlawn, and was born at Dublin, 9th September 1807. He passed from Harrow in 1825 to Trinity College, Cambridge, where he graduated in 1829. After a journey to Spain (its object to fight in the cause of liberty) and his ordination he was curate at Hadleigh, incumbent of Curdridge in Hampshire, and then for four years curate to Samuel Wilberforce, afterwards Bishop of Winchester; and during 1835–46 he published six volumes of poetry, which were favourably received, and which were re-issued as *Poems Collected and Arranged anew* (1865); the first of them was *The Story of Justin Martyr*. In 1845 Trench was presented to the rectory of Itchenstoke; in 1847 he became Theological Professor in King's College, London; in 1856 Dean of Westminster; and in 1864 Archbishop of Dublin, an office which he resigned in 1884. He died 29th March 1886, and was buried in the nave of Westminster Abbey. Trench's poetry was marked by sensibility and refinement, but not by genius. His theological writings laid his contemporaries under deep debt of gratitude, more for their tone and spirit than for originality or critical insight. And in the field of philology, while his interest was not in scientific problems for their own sake, he took pains to secure accuracy in his facts, and contrived to fascinate his readers with the 'fossil poetry and fossil history imbedded in language.' His principal works, some of which ran to many editions, are *Notes on the Miracles* (1846), *Notes on the Parables* (1841), *The Lessons in Proverbs* (1853), *Hulsean Lectures* (1845), *The Sermon on the Mount illustrated from St Augustine* (1844), *Sacred Latin Poetry* (1849), *St Augustine as an Interpreter of Scripture* (1851), *Synonyms of the New Testament* (1854), *English Past and Present* (1855), *An Essay on the Life and Genius of Calderon* (1856), *Deficiencies in our English Dictionaries*, *Select Glossary of English Words* (1859), *The Study of Words* (1851), a memoir of his mother (1862), *Studies on the Gospels* (1867), and *Lectures on Mediæval Church History* (1877). See his *Letters and Memorials* (2 vols. 1888).

Trenck. The cousins Franz and Friedrich, Freiherren (or Barons) von der Trenck, soldiers and adventurers, were descended from an ancient house of East Prussia. The elder, Freiherr Franz, was born at Reggio, in Calabria, on 1st January 1711, where his father was an Austrian general. When he was seventeen he received a commission as a cavalry officer. He fought duels and indulged in such adventures that he had to flee, and went to Russia, where he was made a captain of hussars. Cashiered and imprisoned for insubordination, he returned to settle on his estates in Slavonia. At the outbreak of the Austrian war of succession (1740) he obtained from Maria Theresa permission to raise at his own cost a body of 1000 Pandours (q.v.), who, increased to 5000, formed the advanced guard of the imperial army in Silesia. But Trenck and his Pandours were even more distinguished for outrageous cruelty than for reckless daring; there had been no such monster, says Carlyle, since Attila and Genghiz. On the 7th of September 1742 he attacked Cham, a town in neutral territory, this act being, of course, in defiance of all law and discipline; and he completely annihilated it. After the battle of Sohr, in September 1745, he offered to capture Frederick the Great and bring him a prisoner to the Austrian camp. He failed in the enterprise, with great loss of men, but he secured the king's tent and much valuable booty. Suspicions were, however, entertained that he had allowed the king to escape, or even that he was in communication with the enemy, and he was tried by court-martial. He was imprisoned at Vienna, but made his escape with the assistance of a lady of rank; he was however captured, and condemned to life-long imprisonment in the Spielberg at Brünn, where he poisoned himself, 4th October 1749.

See his Autobiography (1748; new ed. 1807); the Life by Hübner (1788); a monograph, *Freiherr Franz von der Trenck* (3d ed. Celle, 1868); and Carlyle's *Frederick the Great*.

Freiherr Friedrich was born at Königsberg, 16th February 1726, the son of a Prussian major-general, and distinguished himself at the university. At sixteen he became a cornet in the guards; and two years afterwards he attempted some kind of intrigue with the Princess Amalia, and fell into disfavour. The discovery of a correspondence (itself innocent enough) with his Austrian cousin was a pretext for his imprisonment at Glatz, whence in 1747 he escaped to take service in the Austrian army at Vienna. Having returned to Prussian territory on family business, he was clapped in prison by Frederick the Great, and on his attempting to escape from the fortress of Magdeburg was heavily ironed—hands, feet, and waist. He was released on 24th December 1763, and afterwards settled at Aachen, where he married the burgomaster's daughter, and went into business as a wine-merchant. He published his Memoirs in 1787. The book was translated into all languages, and Trenck became more famous than his famous cousin; several plays founded on his adventures were brought out on the French stage. In 1774–77 he had travelled in England and France, and the restless

man received again his confiscated Prussian estate. But having gone to Paris during the Revolution, he was imprisoned by Robespierre as a secret political agent, and guillotined near the Barrière du Trône, 25th July 1794.

See Carlyle's *Frederick the Great;* Trenck's Autobiography (full of exaggerations, 1787); the Life by Wahrmann (1837); the monograph, *Freiherr Friedrich von der Trenck* (3d ed. Celle, 1868); and Vcte. du Jeu, *Trenck: un avanturier prussien du XVIII^e Siècle* (1923). A complete edition of Trenck's collected works, containing his poems, was published in 8 vols. 1786.

Trendelenburg, FRIEDRICH ADOLF, philosopher, was born at Eutin, 30th November 1802, and was for nearly forty years professor at Berlin, and a member of the Academy; he also sat as a Conservative in the Prussian Second Chamber. He died 24th January 1872. His principal works are *Elementa Logices Aristotelicæ* (1837; 8th ed. 1878; trans. as *Elements of Logic,* 1881); *Logische Untersuchungen* (1840; 3d ed. 1870.); *Historische Beiträge zur Philosophie* (1846–67); and *Naturrecht* (1860). See the Memoirs by Bonitz (1872) and Bratuschek (1873), and a work by Orphal (1891).

Trengganu, an unfederated Malay State on the east side of the Malay Peninsula, between Kelantan and Pahang, passed from Siamese to British protection in 1909. It exports dried fish, copra, tin and wolfram ores, areca nuts and rubber. Area, 5000 sq. m.; pop. (1921) 153,092; capital, Kuala Trengganu (12,456).

Trent, a river of central England, the third in length, rising on Biddulph Moor on the north-west border of Staffordshire, and flowing south-east through Staffordshire, then north-east through the counties of Derby, Leicester, Nottingham, and Lincoln, till it unites with the Ouse to form the Humber, about 15 miles W. of Hull. It receives on the right the Sow, Tame, Soar, and Devon, and on the left the Blythe, Dove, and Derwent; passes the towns of Burton, Nottingham, Newark, and Gainsborough; and is about 150 miles long. The construction of a series of locks between Newark and Nottingham (1922–26) enables barges of 120 tons to reach Nottingham. The Trent is also connected by canals with many other Midland manufacturing towns.

Trent (Ital. *Trento,* Ger. *Trient,* Lat. *Tridentum*), a town of Italy, on the left bank of the Adige, in a beautiful and fertile valley, surrounded by high limestone hills, 57 miles by rail N. of Verona. With its spires and towers, ruined castles and ancient embattled walls, it presents an imposing appearance from a distance. It is surrounded by detached forts. The Piazza Dante has a fine monument to the poet (1896). The Piazza Vittorio Emanuele III. is adorned with a splendid fountain of red marble, surmounted by a colossal statue of Neptune with his trident. The cathedral, begun in the 12th century, is a beautiful specimen of Lombard Romanesque, with a few features suggestive of the contemporary German style. The fine Renaissance church of Santa Maria Maggiore (15th century) was the meeting-place of the famous council during the bishopric of Cristoforo Madruzzo (see below). Among other public buildings are the seminarial church (formerly the Jesuits' church), ornamented with the richest foreign marbles; the theatre; the town-hall, formerly the palace of the Counts of Thun; some noble private mansions; and the Castello del Buonconsiglio adjoining the town, a noble specimen of the feudal architecture of North Italy, with fine frescoes recently restored. Trent manufactures silks, wine, pottery, confections, and sugar, and has a brisk transit trade. Pop. (1880) 19,585; (1900) 24,908; (1921) 35,130.

The ancient *Tridentum* or *Tridente* derived its name from the Tridentini, an Alpine tribe, whose capital it was. In 1027 its prince-bishops obtained the temporal rule of the valley of the Adige, and under them Trent rose to great prosperity. Essentially an Italian town it became Austrian in 1803, being incorporated with Tirol (q.v.). After much fighting, however, it returned to Italy from 1810 to 1814, but then became Austrian again, and was only restored to Italy (in the treaty of St Germain, 1919) after the Great War. When hostilities ceased on 4th November 1918 it had been already occupied the day before by Italian troops, which had pushed beyond it as far as Salorno and the hills south-west of Bolzano (Bozen, Botzen). The *province* has an area of 2539 sq. m. and a population of 406,260, and forms with the province of Bolzano the *regione* of Venezia Tridentina. See TIROL. The district surrounding Trent is known as the *Trentino.*

THE COUNCIL OF TRENT, generally reckoned as the eighteenth œcumenical council of the church, assembled at Trent, and sat with certain interruptions from December 13, 1545, until December 4, 1563. From the first outbreak of the Reformation a council of some sort had been called for by both Catholics and Protestants. Luther and his friends thought of one in which all Christians should be represented and the Scriptures accepted as the sole rule of faith. The emperor and many Catholic princes desired a council mainly for the reformation of abuses in ecclesiastical government and discipline, a reform, as the phrase went, 'in the head and members,' and to obtain certain concessions in doctrine and ritual, in the hope of conciliating Protestants and restoring to Europe religious peace. The pope and the Roman court, on the other hand, recognised in general the need of reform, and made sundry efforts in that direction, but for some time regarded the convocation of a council with undisguised aversion, from a well-grounded fear lest the emperor should dictate the subjects of debate and usurp the functions of the holy see, and partly lest the council itself should, in the spirit of some recent synods, presume to declare itself superior to the pope, and initiate reforms unacceptable to the Roman curia. It was the object of the popes, with or without a council, to more clearly define Catholic doctrine, pronounce the condemnation of the new heresies, strengthen the bonds of ecclesiastical unity, and consolidate the papal power. These conflicting aims and interests supply the key to the intricate negotiations which led first to the long delay in the meeting of the council, and subsequently to its several prorogations and suspensions, covering in all a period of more than forty years. Clement VII., who for ten years had resisted the pressure put upon him by Germany, at length, after an interview with the Emperor Charles V. in 1533, consented to call a council at Mantua or some Italian city. The Protestants now in their turn made difficulties, and insisted upon a freedom of debate and a reopening of closed questions which were incompatible with the traditions and principles of the Roman Church. Meanwhile England was lost to the pope, and Paul III. (December 1534), recognising that a council was inevitable, set himself earnestly to overcome all practical difficulties, indicted the council first at Mantua for May 1536, then at Vicenza, and again, without success, at Trent in 1542, until finally the council actually opened at the latter place, as has been said, December 13, 1545, the twelfth year of the pontificate of Paul, with four archbishops, twenty-two bishops, five generals of orders, and two ambassadors, under the presidency of three papal legates, the cardinals Del Monte (afterwards

Julius III.), Cervini, and the Englishman Reginald Pole.

It was at once apparent that, though considerable freedom of speech was tolerated in the course of debate, the procedure of the council and its final decrees were under the immediate control and direction of the pope. Matters for deliberation could only be proposed by the legates, though this was a source of frequent complaint and contention; and the legates on all questions of difficulty awaited the pope's decision. The pope had desired that matters of doctrine should be dealt with first, while the emperor demanded that the council should begin with practical reforms. It was finally agreed that doctrine and discipline should be treated simultaneously in every session. The decrees were prepared in particular congregations, or select committees, afterwards more fully discussed and voted upon in general congregations, and finally proclaimed in public sessions. The position which the council was to take up with regard to the principles of the Reformation was soon made clear. In the fourth session, held April 8, 1546, sacred tradition, or the unwritten Word of God, was put on a par with Scripture, all the books contained in the Vulgate, including the so-called Apocrypha, were declared to be canonical, and the Vulgate version was pronounced 'authentic.' The important doctrine of Justification, which some of the bishops admitted to be comparatively new and to raise questions which the Schoolmen had not fully treated, was after much discussion laid down (sixth session, January 13, 1547) in terms which involved the emphatic condemnation of the Lutheran teaching, as well as of certain moderate views in that direction which had recently found favour within the Roman Church, and had been advocated by Cardinal Pole, who in the preceding October had resigned his legation on the plea of health. Discussions followed on original sin and the sacraments; but while the new heresies were explicitly condemned, care was taken not to close, without grave reason, any questions which divided the Thomists and Scotists or the orthodox schools of Catholic theology. Many ancient subjects of dispute, as, for example, the Immaculate Conception, were thus designedly left unsettled. One of the most prolonged of the party struggles which agitated the council arose at the earliest stage of its proceedings out of a discussion on the laws regarding episcopal residence. The Spanish bishops, who formed a strong minority, and who were at times supported by the French, were eager to strengthen the authority of bishops, and wished the council to define that episcopal jurisdiction was derived immediately from Christ and not through the pope. The Italians, supported by the legates in the interests of papal centralisation, were opposed to any such definition. It was not till towards the close of the council in 1563 that a decree, so worded as to leave the point in ambiguity, was accepted as satisfactory. Meanwhile the legates, seeing the emperor irritated by the action of the council, and his power much increased by the recent course of political affairs, had become anxious to transfer the council to a spot less open to his influence. An epidemic at Trent afforded a sufficient pretext for removing in March 1547 to Bologna. Certain bishops in the imperial interest remained at Trent, and for a time there was risk of a schism. The fathers at Bologna, however, abstained from publishing any decrees; and the few sessions there held related only to successive prorogations until in September 1547 the council was suspended *sine die*.

In February 1550 Julius III. succeeded to the papacy, and in the following year, May 1551, reopened the eleventh session of the Council at Trent under the presidency of Cardinal Crescenzio. It now sat for about twelve months, but in April 1552 the military successes of Maurice of Saxony led to another suspension. Meanwhile, in this second period of the council, the fathers had proceeded with the doctrine of the sacraments, and transubstantiation was defined. Certain Protestants now desired to be heard, and a safe conduct was accorded to their deputies, who were received in a general congregation; but their demands were considered impracticable, and the negotiations came to nothing.

Many years now passed, with little thought or opportunity of renewing the council. Meanwhile, the Emperor Charles V. had abdicated. Julius was succeeded by Cardinal Cervini, Marcellus II., and he in turn by the stern reformer Paul IV. (1555–59), who occupied himself mainly with the organisation and extension of the Inquisition. To Pius IV. (1560–66) belongs the credit of renewing the council, and, by his energy and tact, bringing it to a successful conclusion. This third period, in many respects the most important, begins with the seventeenth session, held in May 1562. Disciplinary decrees were passed regarding episcopal duties, the religious orders, the education of the priesthood, and the censorship of books. Clandestine marriages were by a new law made invalid. The odious office of questors of alms was abolished. Doctrinal decrees were issued on the mass, purgatory, the veneration due to saints, and the doctrine of indulgences.

During these last sessions (seventeenth to twenty-fifth) there were present at one time or another, besides ambassadors and theologians, 270 prelates, of whom 187 were Italians, 31 Spaniards, and 26 Frenchmen. The decrees of the entire council were confirmed, January 26, 1564, by Pius IV., who in the same year published the Profession of the Tridentine Faith, a brief summary of doctrines, generally known as the Creed of Pius IV. (see CREED).

Several important works, recommended or initiated by the council, but which the fathers could not effectually carry out, were handed over to the pope for completion. Thus, the revision of the Vulgate, ordered at Trent in 1546, was finally completed under Clement VIII. in 1592. Pius V. founded the Congregation of the Index to carry out the work attempted but left unfinished by the council. The same pope also undertook the revision of the Breviary, and in 1566 published the *Catechism of the Council of Trent* (see CATECHISM).

The first important history of the council was written in a very hostile spirit by a Servite friar of Venice, Paul Sarpi (q.v.), whose book was published in Italian under a feigned name at London in 1619, and afterwards translated into English by Brent in 1640. The Jesuit, Cardinal Pallavicini, who had access to Vatican archives, wrote a refutation of Sarpi in his *Istoria del Concilio* (2 vols. fol., Roma, 1656). Le Plat, in his *Monumenta Concilii* (Louvain, 1781), printed a large collection of documents; to which must be added the *Acta Genuina*, printed by Theiner (1874) from the diary of Massarelli, the secretary of the council, and the *Sammlung von Urkunden* of Döllinger (1876). The best general history in English is that of the Rev. T. A. Buckley (Lond. 1852), who has also translated the *Canons and Decrees* (1851) and the *Catechism;* with which should be compared, on the Roman Catholic side, Waterworth's *Canons and Decrees*, &c. (1848). An interesting account of the debates within the council will be found in Mendham's *Memoirs* (1834), which includes the history of the synod under Pius IV. by Paleotto, the protonotary. A collection of the historical sources of the council (diaries, acts, letters, &c.) began to be published in 1901 (Freiburg). See also Ranke's *History of the Popes;* Philippson, *La Contre-Révolution Religieuse au XVI^e^ Siècle* (1884); and Dejob, *De l'Influence du Concile de Trente sur la Littérature, &c.* (1884). And see ROMAN CATHOLIC CHURCH, TRANSUBSTANTIATION.

Trent Affair. In October 1861 Captain Charles Wilkes, U.S.N., intercepted at sea the British mail-steamer *Trent*, bound from Havana to St Thomas, and took off two Confederate commissioners accredited to France, senators Mason and Slidell, who were among her passengers. They were taken to Boston, and imprisoned in Fort Warren, but were released on 1st January 1862, on the demand of the British government, and suffered to proceed to Europe. The affair created intense excitement at the time, but Secretary Seward accepted Britain's demand as an adoption of the American doctrine which denied the 'right of search,' and on that ground replied that the prisoners would be 'cheerfully liberated.'

Trente-et-un, Trente-et-quarante. See ROUGE ET NOIR.

Trentino, Trento. See TRENT.

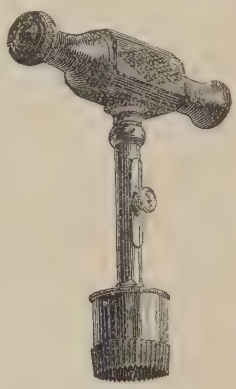
Trenton, the capital of New Jersey, is on the Delaware River, at the head of tide-water and of steam-navigation, 57 miles by rail from New York and 34 from Philadelphia. It is a handsome city, divided into Trenton and South Trenton by Assanpink Creek, with wide, straight streets, in the residence portions delightfully shaded. The public buildings include a commodious state-house, federal buildings, a county court-house, city hall, and state lunatic asylum, arsenal, penitentiary, reform school, and normal school, and there are several homes and hospitals. The Delaware, which is crossed by two fine bridges, is largely utilised for water-power. The industry chiefly identified with Trenton is the production of crockery and pottery, of which it is the principal centre in the United States; but there are other manufactures of scarcely less importance, including iron, steel, and zinc, rubber goods, fire-bricks, &c. On 26th December 1776 Washington here surprised 1500 Hessians, and captured nearly 1000, after crossing the Delaware during the night, amid blocks of floating ice and in the face of a fierce snow-storm. Pop. (1880) 29,910; (1920) 119,289.

Trenton Falls, a village of New York, on West Canada Creek, 17 miles by rail NW. of Utica, celebrated for its beautiful cascades (five, within a deep, narrow limestone ravine), with an aggregate fall of nearly 400 feet in 2 miles.

Trepan. See TREPHINE.

Trepang, the Malay name for species of Holothuria, principally *H. edulis* and *H. nigra*, much esteemed in China as a food delicacy. It passes also under the name of 'bêche de mer,' or sea-slug. The ordinary kind resembles a prickly cucumber; but they vary in colour when dried, being black, white, or red. There are no less than thirty-three different varieties enumerated by Chinese traders. It is gutted, boiled, split open, and smoke-dried. The average size is about 8 inches long, but some are found 2 feet in length. In the commercial form it is very hard and rigid, but when boiled down into a kind of gelatinous soup it is much esteemed. The fishing is carried on extensively on the northern coast of Australia, in India, Fiji, Tahiti, Macassar, Sumatra, and New Caledonia. Although there are so many varieties, only about five kinds have any great commercial value—viz. brown, large and small black, red, and white: these rank in importance in the order given. It is only in China (where it is valued as an aphrodisiac) that this marine food-substance is appreciated; some is shipped annually from India to Hong-kong, and a little also from Japan.

Trephine. The instrument in its original form was like a carpenter's brace, and was called a *trepan*, from Gr. *trypaō*, allied to Lat. *tereo*, 'I bore.' The operation of trephining consists in the perforation of a bone, usually the skull, by means of a trephine, which is a small cylindrical or circular saw, with a centre-pin on which it works. It is practised on the skull in cases of fracture, chiefly when symptoms of compression or irritation of the brain are produced by depressed portions of bone, or by hæmorrhage beneath the skull; as a necessary preliminary to all operations on the brain—e.g. the evacuation of abscesses; for the removal of the focus of irritation in certain cases of epilepsy, &c., particularly where the disease has followed injury to the head; and even in rare cases for the removal of tumours. Trephining was known and practised in prehistoric times; many skulls of the Stone Age that had been thus practised on are to be found in archæological museums. Comparatively recently it was used almost as a routine treatment in severe head injuries; but it is now restricted to a very small proportion of such cases. The advance of knowledge of localisation of function in the brain, and the introduction of antiseptic methods in surgery have, however, extended its scope in other directions. It has more recently been applied to the treatment of tumours of the brain as well as other diseases of the head, and in certain forms of idiocy and insanity.



Trephine.

Trespass, in Law, is a physical interference with the person or property of another. However innocent the act, if it be voluntary, a legal wrong is done. Thus, if pursued by a wild beast you deliberately take refuge in another man's house, you commit a trespass; but if you rush there in mere blind fear, you do not. Again, if you drive in so careless a manner as to hurt any one, though unintentionally, this is a trespass. If animals or, indeed, any chattels are on a man's land doing damage, they may be seized and impounded till compensation be made. This remedy is called distress *damage feasant*. It is similar to distress at common law—e.g. there is no power of sale. If a dog worry cattle or sheep, the owner is liable since 1863. Formerly it was necessary to prove *scienter*—i.e. knowledge by the master of the animal's vicious disposition. *Scienter* must still be proved in other cases, and generally when animals, not savage by nature, do hurt—a legal doctrine quaintly parodied in the vulgar saying, that the dog is entitled to his first bite. Even in complete absence of real injury an action for trespass will lie, for, says Lord Denman, those rights are an extension of that protection which the law throws round the person. A verdict of a farthing damages is, however, the frequent and appropriate compensation for injury without damage (*injuria sine damno*).

As will be seen, there are various kinds of trespass: (1) trespass to goods, which consists in damaging them physically, as *asportation*—i.e. carrying them away; (2) trespass to the person, which is either battery, assault, or false imprisonment. Battery is an active attack on any one. Assault (q.v.) is an attempted battery; both are criminal offences as well as civil wrongs. False imprisonment is usually classed among the latter. It consists in depriving a man of his liberty without lawful excuse. Compelling any one to submit by the exhibition of superior force, though no

actual violence be used, is a wrong of this nature. If a constable intervene, the question is, did he do so of his own initiative, or at the prompting of a third party? In the second case only, even if the arrest be illegal, can the third party be held liable for the false imprisonment. Trespass to the person may be justified on the ground that a man was acting in self-defence, that it was necessary to stop a breach of the peace, to apprehend a felon, or to assist police-officers in the execution of their duty, and that the person arrested was dangerous to himself and others. Various acts give power to arrest those found committing certain specified misdemeanours.

As regards trespass to land, since a plaintiff must succeed by the strength of his own, not by the weakness of his adversary's case, bare possession is a good title as against a wrong-doer; so the occupier may turn out an intruder, using, upon his refusal to depart peaceably, as much force as is necessary. If the possessor be forcibly turned out, he may forcibly re-enter, even though outer doors be broken open to effect the purpose. But this must be done immediately, otherwise the owner, though entitled to possession, will, if he use violence, render himself criminally liable under the statutes of Forcible Entry. In making a distraint for rent, or in levying an execution, but not in executing criminal legal process, it is a trespass to break open the outer door. Although the general rule is that any entry on another's land is a trespass, yet in certain cases of necessity an entry is excused—e.g. to abate a nuisance, or to prevent the spread of fire. A customary right of recreation or right of way will excuse what would otherwise be a trespass. Cut glass or spikes on a wall are allowable as a defence against intruders; but not man-traps or spring-guns (except inside a dwelling-house), at least since 1827. Even before that a trespasser could recover for damages so done to him, unless he had notice of the existence of the engines in question. The mere act of trespassing on another's land is not a criminal offence, but by statute it is when in pursuit of game, on railways, on places where explosives are stored or animals afflicted with contagious disease are confined. Besides the remedies for trespass—viz. forcible expulsion and an action for damages—an injunction may be granted, even for a bare trespass, since the Judicature Act of 1873. The law of the United States is based on the English law.

The term trespass, in Scots law, is borrowed from that of England. It is restricted to trespass to land. The law on the subject is generally the same as in the rest of the United Kingdom. The Trespass Act, 1865, provides a summary form of punishment for those who camp upon open land, or lodge in premises or enclosures without leave. Against mere trespassers an interdict may be obtained. See RIGHT OF WAY, POACHING, GAME-LAWS.

Trevelyan, SIR CHARLES, was born on 2d April 1807, the fourth son of the Archdeacon of Taunton, and was educated at the Charterhouse and Haileybury College. He entered the East India Company's service, and became assistant-secretary to the Treasury (1840–59), governor of Madras (1859–60, being recalled for his protest against new taxes proposed), and Indian finance minister (1862–65). He was created a K.C.B. in 1848, and a baronet in 1874; published several works on educational and philanthropic subjects; and died on 19th June 1886.—His son, the Right Hon. Sir GEORGE OTTO TREVELYAN, by his first wife, Hannah, Lord Macaulay's sister, was born at Rothley Temple, Leicestershire, on 20th July 1838. He passed from Harrow to Trinity College, Cambridge, and graduated as second classic (1861). In 1865 he was returned for Tynemouth in the Liberal interest, in 1868 for the Border Burghs, and he became a Lord of the Admiralty (1868–70), parliamentary secretary to the Board of Admiralty (1880–82), Chief-secretary for Ireland (1882–84) as Lord Frederick Cavendish's successor, and a member of the Privy-council, chancellor of the duchy of Lancaster, with a seat in the Cabinet (1884–85), and Secretary for Scotland (1886). Defeated in the Borders at the general election (1886) as a Unionist, in August 1887 he regained admission to parliament for Bridgeton (Glasgow) as a Gladstonian, was re-elected in 1892, was Secretary for Scotland (1892–95), and was re-elected in 1895, but retired from public life in February 1897. He wrote *Horace at the University of Athens* (1861) and *The Ladies in Parliament* (1869), two brilliant Aristophanic skits; *Letters of a Competition Wallah* (1864); *Cawnpore* (1865); the admirable *Life and Letters of Lord Macaulay* (1876–1908); the *Early History of Charles James Fox* (1880); and *The American Revolution* (1899–1914).—Sir George's eldest son, CHARLES PHILIPS TREVELYAN, born in London 28th October 1870, and educated at Harrow and Trinity College, Cambridge, sat as a Liberal for Elland 1899–1918. He became Parliamentary Secretary to the Board of Education in 1908, but resigned in 1914, disapproving of the government's war policy. He re-entered parliament in 1922 as Labour member for Central Newcastle, and was president of the Board of Education in Mr MacDonald's government.—GEORGE MACAULAY TREVELYAN, another son of Sir George, born 16th February 1876, was also educated at Harrow and Trinity College, Cambridge. Besides a series of notable books on Garibaldi he has written *A History of England* (1926) and other works on British history.

Trèves. See TRIER.

Trevet. See TRIVET.

Treviranus, GOTTFRIED REINHOLD (1776–1837), and his brother, LUDOLF CHRISTIAN (1779–1864), are eminent in the history of biology. See EVOLUTION, and BIOLOGY.

Trevisa, JOHN (*c.* 1326–1402), a Cornishman, fellow of Exeter and Queen's Colleges, Oxford, vicar of Berkeley, and canon of Westbury (most likely Westbury-on-Trym near Bristol), Englished Bartholomæus Anglicus, Higden, and other authors—probably also the Bible. See a monograph by H. J. Wilkins (1915), and A. J. Perry's introduction to the *Dialogus inter Militem et Clericum*, &c. (E.E.T.S. 1925).

Treviso (the ancient *Tarvisium*), the capital of an Italian province, on the Sile, 17 miles N. of Venice by rail. It has a cathedral dating from 1141, restored and enlarged in the 15th century, with pictures by Titian and Pordenone; the Gothic church of San Nicolo (1310–52); and a public library (100,000 vols.). Other churches contain art treasures, and the picturesque battlemented Palazzo dei Treiento in the main square is noticeable. The 15th century town-walls are still preserved. Treviso has various manufactures, and is the centre of a fertile district. Pop. of commune (1921) 49,737.

Trevithick, RICHARD (1771–1833), one of the pioneers of railway travelling. See RAILWAYS, and the Life by Francis Trevithick (1872).

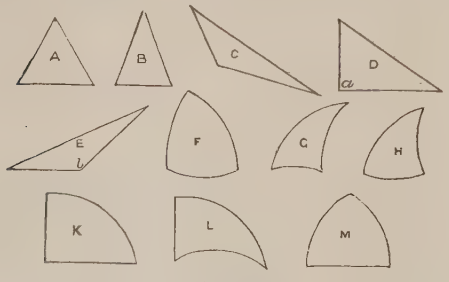
Trevor, SIR JOHN, born in 1633, in the parliament which met on 19th May 1685 was elected Speaker of the House of Commons. 'Trevor,' says Macaulay, 'had been bred half a pettifogger and half a gambler, had brought to political life sentiments and principles worthy of both his callings, had

become a parasite of Jeffreys, and could on occasion imitate not unsuccessfully the vituperative style of his patron. The minion of Jeffreys was, as might have been expected, preferred by James, was proposed by Middleton, and was chosen without opposition.' In the same year he was made Master of the Rolls. He contrived to maintain his political and judicial position after the revolution of 1688, and was re-elected Speaker in 1690, on an understanding with the government that he was to take the management of the bribery department. As first commissioner of the Court of Chancery, his integrity was greatly suspected; and though he was deficient neither in learning nor in parts, his greed and venality at length became notorious. In 1695 a committee of the House of Commons reported that in the preceding session Sir John Trevor had received 1000 guineas from the city of London for expediting a local bill. When it was moved in the House that the Speaker had been guilty of a high crime and misdemeanour, he had himself to put the question, and to declare that the 'Ayes' had it. A few days afterwards he was formally expelled. He still, however, retained the Mastership of the Rolls, 'to the great encouragement' says North, 'of prudent bribery for ever after.' He died 20th May 1717.

Trial. See CRIMINAL LAW, JURY. For Trial by Combat, see BATTLE (WAGER OF).

Trialism. See AUSTRIA-HUNGARY, p. 610.

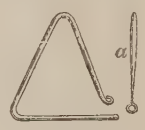
Triangle (*tres*, 'three,' *angulus*, 'a corner'), the most simple of closed geometrical figures, is a figure having three angles, and consequently three sides. It is, indeed, generally defined by geometers as a figure of three sides, and its property of being three-angled is put in the subordinate position of a necessary consequence. In plane geometry a triangle is bounded by three straight lines; and triangles are classed according to the relative length of their sides into *equilateral* (A), or equal-sided; *isosceles* (B), or having two sides equal; and *scalene* (C), or unequal-sided. Considered with reference to the size of its angles, a triangle is *right-angled* (D) when one of its angles (*a*) is a right angle (90°), *obtuse-angled* (E) when it has one angle (*b*) greater than a right angle,



Triangles.

and *acute-angled* (A or B) when it has no angle so great as a right angle. The triangle being the fundamental figure of plane geometry, through which the properties of all other figures have been arrived at, the investigation of its properties has always been held to be of primary importance. The simpler of these properties have of course long been known; but in modern times a whole system of geometry has grown up known as the geometry of the triangle, in which an endless number of remarkable properties are discussed. To the modern geometer the triangle connotes not merely the closed figure bounded by the sides, but the outside regions of space marked off by the sides produced to infinity. Of special importance also are those lines drawn through the angles which bisect these angles, or bisect or are perpendicular to the opposite sides. Then there are many interesting theorems connected with the inscribed, circumscribed, and escribed circles (see Casey's *Sequel to the First Six Books of Euclid*). The area of a triangle is half of that of a parallelogram which has the same base and altitude, and is thus equal to half the product of the base into the altitude. In the geometry of the sphere a triangle is a figure bounded by three arcs of circles (as F, G, H, K, L, and M). For triangulation, see ORDNANCE SURVEY, SURVEYING, TRIGONOMETRY; for triangular numbers, see FIGURATE NUMBERS.

Triangle, a musical instrument of percussion, formed of a steel rod bent in triangle-form, open at one angle, as shown in the figure. It is suspended by means of a string attached to the upper angle, and struck with a steel beater (*a* in figure). Many composers use it in their works as an adjunct to the drums, and it has a place in all military bands.



Triangulation. See ORDNANCE SURVEY.

Trianon. See VERSAILLES. The treaty of Trianon, signed 4th June 1920, made peace between Hungary and the 'Allied and Associated Powers.' Hungary ceded to Czechoslovakia a great stretch of territory in the north, including all Slovak and Ruthenian country; to Rumania Máramaros (Maramuresh), Crisana, Transylvania, and part of the Banat—all the Rumanian and German speaking regions of the east, with a Székler population as well; to the Serb-Croat-Slovene state a stretch of territory along the river Mur, Croatia-Slavonia, and parts of the Banat, Bács-Bodrog, and Baranya—mainly South Slav in population. Fiume was given up, its fate to be decided later. Burgenland went to Austria, but much of it was soon afterwards regained. For limitations placed upon Hungary's armed forces, see HUNGARY. On the whole, Hungary was treated much as Germany had been, with more ruthless reduction of territory. See also DANUBE.

Triassic System. This forms the basement group of the Mesozoic or Secondary strata, and was formerly associated with the Permian System under the name of the New Red Sandstone. The term *trias* has reference to the threefold grouping of the system in Germany, where the strata are more fully developed than in Britain. In our area the system rests unconformably upon the upturned and denuded edges of the Permian and older Palæozoic strata. It is well developed in the central plains of England, whence a long belt extends north from Nottingham to the valley of the Tees, while another band stretches down the Severn valley into Devonshire. Small areas likewise occur in Dumfriesshire and near Elgin, and also in the north of Ireland. The system, however, assumes more importance in central Europe, where it occurs at the surface over a wide tract between the Thüringerwald in the east and the Vosges Mountains in the west, and between Basel in the south and Hanover in the north. North of that region it continues underneath overlying formations, but appears again and again at the surface where these latter are wanting. Trias is also met with in Heligoland and the south of Sweden. In all the regions now noted the strata appear to have been deposited in inland seas, and the following table gives the general succession of strata:

Rhætic.	Dark shales, red, green, and gray marls, thin gray limestones, sandstones, and bone-beds (Penarth Beds); and in Germany occasional thin coal-seams.
Upper Trias or Keuper.	Red, green, and gray marls and shales, and thin sandstones, with rock-salt and gypsum. Red sandstones and marls (England); gray sandstones, marls, and clays, with thin coal-seams (Germany).
Middle Trias or Muschelkalk.	Limestones and dolomites, with associated beds of rock-salt, gypsum, and anhydrite. Not represented in England.
Lower Trias or Bunter.	Mottled red and green sandstones, marls, and conglomerates; with (in Germany) occasional beds of dolomite, rock-salt, and gypsum.

In the Alpine regions the Trias differs much from that of England and Germany. It attains a thickness of many thousand feet, and forms ranges of mountains. The lower division consists chiefly of fossiliferous limestones, the middle of shales, marls, limestones, and dolomites, while the Rhætic is built up mainly of limestones and dolomites. Thus in north-western and central Europe we have one well-defined type consisting of strata which have accumulated for the most part in inland seas, while in the Alpine regions the character of the beds betokens more open water. In France isolated areas of Trias occur, some of which approximate in appearance to those of England, while others resemble those of Germany. In Spain and Portugal both the German and Alpine types are represented.

In North America the Trias is well developed, as in Nova Scotia, Prince Edward Island, the Connecticut valley; the west side of the Hudson River, and south-west through Pennsylvania into Virginia; North Carolina. Strata believed to be of the same age cover wide areas in the western territories, extending from the eastern borders of the Rocky Mountains into Alaska, British Columbia, and California. Brick-red sandstones and marls are a prominent feature in all those areas. Like the similar rocks of Europe they contain few fossils, but animal tracks and footprints are of frequent occurrence. On the whole the American strata above referred to resemble the English type of the Trias. But on the Pacific slope, in Northern California and Mexico, the strata yield a plentiful marine fauna, and resemble the type of the Alpine Trias. Rocks of Triassic age have been recognised in Spitsbergen, in the Himalayas, and again in South Africa, in New Zealand, and New South Wales, where the strata contain clay iron-stone and thin seams of coal.

Life of the Period.—The predominant plants were cycads (Pterophyllum, Zamites, &c.), horsetails (Equiseta), ferns, and conifers, especially the cypress-like Voltzia. In the red beds of the Trias few fossils occur, our knowledge of the life of the period (more especially the invertebrate life) being derived from the Rhætic, the Muschelkalk, and the marine strata of the Alpine Trias. Foraminifera, sponges, star-corals, and echinoderms were tolerably numerous. One of the most beautiful fossils is the lily encrinite (*Encrinus liliiformis*) of the Muschelkalk. Amongst Lamellibranchs Myophoria, Avicula, Pecten, Cardium were common forms. A number of Palæozoic genera of Gasteropods (Loxonema, Murchisonia, &c.) appear, commingled with newer forms. The same is the case with the Cephalopods, such old genera as Orthoceras, Cyrtoceras, and Goniatites occurring along with Ceratites and other members of the great tribe of Ammonites. This remarkable association of Palæozoic and Mesozoic genera is most notable in the Alpine Trias. In the same strata occur the earliest traces of dibranchiate cephalopods, represented by the internal bone or shell (Belemnites). The Triassic fishes are ganoids and placoids—the latter represented by spines and palate teeth (Ceratodus). Labyrinthodonts abounded, and are known chiefly through their footprints, which are often plentiful in the red beds of the Trias. Some of these creatures attained a large size—the skull of one (*Mastodonsaurus*) measuring over 3 feet in length by 2 feet in breadth. Lizard-like reptiles (Telerpeton, Hyperodapedon) were numerous, while crocodiles (Stagonolepis) made their first appearance. The same is the case with the extinct group of Dinosaurs—terrestrial reptiles, some of which could walk on their hind-feet, which were often only three-toed—their front feet being four-toed. The footprints of these Dinosaurs are very numerous in some sandstones, and the three-toed impressions were at first supposed to be those of birds. They vary in size, the largest being nearly 2 feet long. Swimming reptiles (Nothosaurus) have also been recorded from the Trias. Another remarkable group of reptiles were represented by Dicynodon, which had a horny beak and carried two large tusk-like teeth in the upper jaw. The Trias is further remarkable for having yielded the earliest relics of mammalia. They seem to have been small marsupials (Microlestes, Dromatherium), with some affinities to the little Banded Ant-eater of Australia.

Physical Conditions.—The British Triassic strata afford evidence of having, for the most part, been deposited in a great inland sea or salt lake, from the waters of which sodium chloride (rock-salt), gypsum, and other chemically-formed materials were precipitated. This inland sea covered a large part of England, and extended north into southern Scotland and across what is now the area of the Irish Sea into the north-east of Ireland. It is possible also that the same sea stretched into northern France. Another but smaller lake is indicated by the red sandstones of Elgin. The lands surrounding these lakes were clothed with cypress-like evergreens, and their shores were haunted by labyrinthodonts and various reptiles. The briny waters were unfavourable to life, and we have consequently few traces of any aquatic fauna, which seems to have consisted chiefly of small phyllopods (Estheria) and fishes. Eventually the lacustrine areas became largely silted up, and then subsidence of the land took place, so that the sea occupied some of the shallow depressions. In these marine tracts the Rhætic beds were deposited.

On the Continent during a large part of the Triassic period an inland sea extended westwards from the Thüringerwald across the Vosges country into France, and stretched northwards from the confines of Switzerland over what are now the low grounds of Holland and North Germany. In this ancient sea the Harz Mountains formed an island. In the earlier stages of the period the conditions resembled those that obtained in Britain, but the thick Muschelkalk with its numerous marine forms seems to indicate an influx of water from the open sea. Afterwards, however, this connection was closed, and the subsequent accumulations point to increasing salinity, during which chemical formations (gypsum, rock-salt, &c.) took place, while the marine fauna disappeared. Towards the close of the period, after the great inland lake had been largely silted up, a partial influx of the sea introduced a fauna comparable to that of the English Rhætic. It seems highly probable that the lands surrounding the inland lakes of central and north-western Europe were more or less dry and sandy regions, like the great wastes of central Asia. Many of the sandstones in the Bunter series of England are made up of grains so completely worn and rounded that they exactly recall the appearance presented by the wind-blown sands of desert regions. Some geologists therefore infer that in

the earlier stages of the Triassic period large tracts of Britain were sandy deserts before the inland sea attained its greatest development.

The Alpine Trias, which is mostly marine, shows that, while continental and lacustrine conditions obtained in central and north-western Europe, an open sea existed towards the south—a Mediterranean of much greater extent than the present. From the fact that Triassic rocks with characteristic fossils occur within the Arctic regions, it may be inferred that the climate of the period was generally genial or warm.

Tribe, an aggregate of stocks—a stock being an aggregate of persons considered to be kindred—or an aggregate of families, forming a community usually under the government of a chief. The chief is possessed of despotic power over the members of the tribe, which is one of the earliest forms of the community among all the races of men. The discussion of the origin of tribes will be found in the article FAMILY; see also MARRIAGE, CLAN, and the articles on peoples, such as the American Indians, whose organisation is tribal (cf. IROQUOIS).

Tribonian (Tribonianus), a very eminent Roman jurist of the 6th century, of Macedonian parentage, but born in Paphlagonia. He held under the Emperor Justinian the offices of quæstor, master of the imperial household, and consul. But he is famous chiefly through his labours in connection with the Code (q.v.) of Justinian (q.v.) and the Pandects. Tribonianus died in 545.

Tribulus, a genus of xerophilous herbs of the family Zygophyllaceæ, inhabiting south Europe, Asia, Africa, and America. The fruit is distributed by means of sharp, stiff spikes, which catch in the fur of animals, or in their feet, after the manner of the Roman *tribulus*, for which see CALTROP.

Tribune. See ROME (*The Republic*).

Triceps. See ARM.

Triceratops, a Cretaceous dinosaur of North America, with a great skull bearing three horns, and a bony frill on the neck.

Trichiasis. See EYE.

Trichilia, a tropical genus of trees of the family Meliaceæ; several African species yield oil-nuts used in soap-making.

Trichina (*Trichinella spiralis*), a minute parasitic Nematode, occurring especially in rat, pig, wild-boar, and man, the adults in the small intestine, the larval stages encysted in muscle. The female is three to four millimetres in length, the male a little less than half that. If a pig devour a dead rat with larval Trichinæ in its muscles, these are set free in the intestine; they feed, grow, moult, pair, and multiply. The males die after copulation; the females bore in or through the wall and liberate young ones viviparously, in the lymph spaces in particular. Each female produces about 1500 larvæ, 60 to 80 at a time. The larvæ migrate, often in large numbers, for the most part passively in the blood-stream; they penetrate through the capillaries into the intramuscular connective tissue, and thence into the muscle-fibres, where they coil in a spiral and encyst, causing degeneration. They may remain alive for many years, but will not develop further unless the muscle be eaten by an appropriate second host. If man should eat trichinosed pig's flesh in which the Trichinæ have not been killed by curing and cooking, he will be the scene of what has been described for the pig. See Braun's *Animal Parasites of Man* (1916).

Trichina lying coiled up in muscle (magnified).

Trichinopoli, the capital of a district (4319 sq. m.) in Madras Presidency, on the right bank of the Kaveri, 56 miles from the sea. At least seventeen villages and hamlets are included in the municipal limits. The fort, which includes the old town, is dominated by a mass of gneiss 273 feet above the level of the street. There are two temples upon it. The walls of the fort, which are now demolished, had a circuit of two miles, and this area is inhabited by a dense population. The moat has been laid out as a boulevard, and the Nawab's palace, which was restored in 1873, has been utilised for courts and offices. Beyond the walls is St John's Church, where Bishop Heber was buried in 1826. The troops are stationed 1½ mile south of the fort. There are a market (1868), military and municipal hospitals, and an observatory. Cheroots are made in large quantity, chiefly from excellent tobacco grown at Dindigal. Manufactures of hardware and jewellery, especially gold chains, are extensively carried on. It is the residence of a Roman Catholic bishop, with a first-grade Catholic college affiliated with Madras University; and the Lutherans, Wesleyans, and the Society for the Propagation of the Gospel have missions, and the last mentioned a first-grade college. Pop. (1921) 120,422.

Trichinosis, or TRICHINIASIS, a disease caused by the parasite Trichina (q.v.).

Trichiurus. See HAIR-TAIL.

Trichodectes. See SHEEP-LOUSE.

Trichodesmium, a genus of algæ belonging to the blue-green seaweeds (Cyanophyceæ), but red in colour. Vast floating masses occur in tropical seas; and it is supposed that the Red Sea takes its name from the great banks of *T. erythræum* that appear in it from time to time.

Trichoptera. See CADDIS-FLY.

Trichromatic Theory of Thomas Young (q.v.). See COLOUR PERCEPTION; and for applications, ILLUSTRATION, PHOTOGRAPHY.

Tricolor. See FLAG.

Tricoupis, CHARILAOS (1832–96), Greek statesman, born at Nauplia, a son of Spyridion Tricoupis, was foreign minister (1866), and several times prime minister between 1875 and 1895. He aimed at strengthening Greece as a military and naval power, and developing communications.

Tricoupis, SPYRIDION, a modern Greek statesman and writer, was born at Missolonghi, 20th April 1788. He served as private secretary to Lord Guilford in the Ionian Isles, but took his place amongst the patriots on the outbreak of the war of independence. From 1821, except during the presidency of Capo d'Istria, he was continually employed in administrative and diplomatic business, was thrice sent to London as envoy-extraordinary, was minister of foreign affairs and of public instruction (1843), vice-president of the senate (1844–49), and envoy-extraordinary to Paris (1850). He died February 24, 1873. His speeches were collected at Paris (1836). Notable also are his poem on the Klephts (1821) and his *History of the Greek Revolution* (1853–57).

Tricuspid. See HEART.

Tricycle. See CYCLING.

Tridacna. See CLAM.

Trident, a three-pronged fork used by fishermen, is employed as the attribute of Poseidon (Neptune), and is frequent on coins of such Greek states as had Poseidon for patron deity. The con-

ventional figure of Britannia bears a trident as the symbol of sovereignty over the sea.

Tridentum. See TRENT.

Tridymite, a mineral composed of silica, which occurs in various acid igneous rocks in the form of thin transparent six-sided plates, several of which are usually grouped together. It is very brittle, has a hardness of 7, and specific gravity of 2·25 to 2·33. The mineral occurs in cavities in the more acid igneous rocks, as in those of the Siebengebirge, Mont Dore, Euganean Hills, Ireland, Iceland, Mexico, &c. It is also met with scattered through the ground-mass of volcanic rocks, as at Kosemütz in Silesia, Kaschau, Hüttenberg in Carinthia, &c.

Triennial Acts. See PARLIAMENT.

Trient. See TRENT.

Trier (Fr. *Trèves*), a city of Rheinland, lies on the right bank of the Moselle, in a valley between low vine-covered hills, 69 miles by rail SW. of Coblenz. The river is crossed here by an eight-arch bridge, 623 feet long, whose Roman piers date from 25 B.C. 'A quiet old-fashioned town, Trèves,' Freeman says, 'has a body of Roman remains far more numerous and varied, if not individually more striking, than any other place north of the Alps can show.' These include the 'Porta Nigra,' 118 feet long, and 95 high, one probably of the five gates by which Trier was entered in Constantine's time; the so-called Roman baths (more probably part of an imperial palace); and a basilica built of Roman brick by Constantine for a court of justice, but demolished in great measure to make room for an electoral palace in 1614. This, however, was removed, and the basilica fitted up for a Protestant church in 1856. Beyond the walls are the ruins of an amphitheatre that could seat 30,000 spectators; and 6 miles off is the 'Igelsäule' or 'Heidenturm,' a monumental column, 71 feet high, sculptured with bas-reliefs of the 2d century. The cathedral of SS. Peter and Helena is an interesting structure of various antiquity, but chiefly in the early German Romanesque style of the 11th century. The most famous of its relics is the seamless or 'Holy Coat,' which consists of 'connected fragmentary particles of material.' Said to have been brought to Trier by the Empress Helena, it is first referred to in 1106 by an anonymous monk, and was not a source of revenue till 1512. It was visited by nearly two million pilgrims in 1891, the first time of exhibition since 1844. A 'Holy Coat' is also shown at Argenteuil and in nineteen other places. Connected with the cathedral by a cloister is the beautiful Liebfrauenkirche (1243); and there is an extensive library containing many MSS., among them the 'Codex Aureus' of the Gospels, presented to the abbey of St Maximin by Charlemagne's sister Ada. A university, founded in 1472, was suppressed in 1798. The industries comprise manufactures of woollens, cottons, and linens, besides a brisk trade in corn, timber, and Moselle wine. Pop. (1871) 21,442; (1891) 36,162; (1910) 49,112; (1919) 53,248; (1925) 57,341.

Trier, which claims to be 1300 years older than Rome, derives its name from the *Treviri*, a Gallic or, more probably, a Belgic people, who in Cæsar's time inhabited a large district between the Meuse and the Rhine. Their capital, *Augusta Trevirorum*, seems to have become a Roman colony in the reign of Augustus, and ultimately was the headquarters of the Roman commanders on the Rhine, and a frequent residence of the emperors, especially Constantine. Sacked by Attila in 451, it passed to the Franks in 463, to Lorraine in 843, to Germany in 870, and back to Lorraine in 895, and was finally united to Germany by the Emperor Henry I. The Archbishop of Trier was, as chancellor of Burgundy, one of the Electors of the Empire, a right which originated in the 12th or 13th century, and which continued till the French Revolution. The last elector removed to Coblenz in 1786; and Trier was the capital of the French department of Sarre from 1794 till 1814, since which time it has belonged to Prussia.

Trieste, a town of Italy (till 1918 the most important seaport of Austria-Hungary), stands at the head of the Gulf of Trieste, an arm of the Gulf of Venice. In 1849 it was constituted an imperial free city, and attached and belonging to it was a territory 36 sq. m. in extent. The city of Trieste, in which the population of the district is almost wholly massed, consists of the old town, the new town, and two suburbs. The old town, built on the slope of a steep hill crowned by a castle (1470–1680), is distinguished by its narrow streets and black walls. It contains the cathedral of S. Giusto, a Byzantine edifice built between the 5th and 14th centuries, into the walls of which stones bearing Roman inscriptions and carving have been built, and the tower of which is said to rest on the foundation of a temple of Jupiter, Juno, and Minerva. Here are also the Museo Lapidario, and the so-called Arco di Riccardo, perhaps part of a Roman aqueduct. The new town, with broad streets built in regular parallelograms and handsome houses, occupies the plain that fronts the sea. Between these two divisions runs the *Corso*, the chief thoroughfare. The *Tergesteo* (1842), in the new town, is a splendid modern edifice, containing an exchange and reading-rooms. Close by are the museums. Trieste, which from 1719 till 1st July 1891 was a free port, has a very fine harbour (1868–83, with later additions). It is the most important on the Adriatic. The Lloyd Triestino navigation company, formerly the Austrian Lloyd, makes its headquarters here. The manufactures are very extensive, including shipbuilding, rope-making, and the manufacture of soap, rosoglio, white-lead, leather, &c. Trieste is also the headquarters of important insurance offices. Pop. (1810) 29,908; (1880) 144,844; (1890) 158,344; (1900) 134,143, or, with suburban villages and garrison, 178,680; (1921) 238,655.

Trieste, the ancient *Tergeste*, was of importance under the Romans, and first receives historical mention in 52 B.C., when it was overrun and plundered by neighbouring tribes. After the fall of the Roman Empire it suffered greatly from barbarian invasions. After many political changes, in 1382 it passed into the hands of Austria, and its prosperity is chiefly owing to the Emperor Charles VI., to whom its constitution as a free port was due, and to Maria Theresa. During the World War continued efforts were made to advance on Trieste, but the Italian armies were never able to pierce the strong defensive positions of the Carso. After the final victory on the Piave, Trieste was occupied from the sea on 3d November 1918, and definitely became Italian under the treaty of St Germain, though it had always been a centre of Italian patriotism under Austrian rule. A 'lighthouse of victory' (1927) commemorates its acquisition by Italy. A university was founded in 1924. Charles Lever and Sir Richard Burton were consuls here. Trieste is now the capital of the province of the same name: area, 474 sq. m.; pop. 325,940.

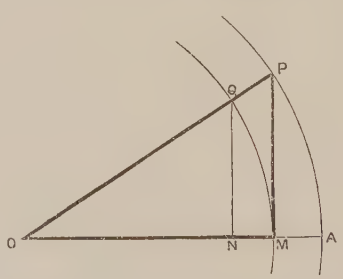
Trifolium. See CLOVER.

Triforium, the arcade over the arches of a church between the nave and side aisles. It is usually a dark gallery, being the wall-space against which the lean-to roof of the aisles rests. See GOTHIC ARCHITECTURE.

Triglyph. See ENTABLATURE.

Trigonocarpon. See CARPOLITES.

Trigonometry, originally the branch of geometry which had to do with the measurement of plane triangles. This gradually resolved itself into the investigation of the relations between the angles of the triangle, for the simple reason that all triangles having the same sets of angles are similar, so that if, in addition, one side is given the other two at once follow. It is easy to show from the Sixth Book of Euclid that, if we fix the values of the angles of a triangle, the ratio of the sides containing any one of these angles is the same whatever be the size of the triangle. This ratio is a definite function of the angles; and it is with the properties of such ratios that trigonometry has now to deal. The fundamental ratios are obtained from a right-angled triangle, of which one angle is the angle under consideration. It will suffice to show what these ratios are and how they have received their names. Let POM be the angle considered, PM being drawn perpendicular to OM. With centre O describe the two circles PA and MQ. The appropriate measure of the angle at O is the ratio of the subtended arc to the radius —i.e. either $\widehat{AP}/OP$ or $\widehat{MQ}/OM$ (see CIRCLE). This measure we shall adopt throughout, and shall represent it by the symbol θ. If QN is drawn perpendicular to OM, then the ratio of any pair of sides of the triangle OQN is equal to the ratio of the corresponding sides of triangle OPM. All the possible ratios which can be formed are the so-called trigonometrical or circular functions of the angle θ. Thus the ratio PM/OP or QN/OQ is the *sine* of θ. It is evidently half the chord of the angle 2θ; and its value is numerically less than θ, because PM being less than the chord PA is less than the arc PA. Again, the ratio PM/OM is the *tangent* of θ. MP is, in fact, the geometrical tangent drawn from the one extremity of the arc MQ till it meets the radius through the other extremity. For a similar reason the ratio OP/OM or OQ/ON is called the *secant* of the angle θ. In the same way the ratios OM/OP, OM/PM, OP/PM are respectively the *sine*, *tangent*, and *secant* of the angle OPM, which is the complement of the angle POM. Hence these ratios, regarded as functions of θ, are called the *cosine*, *cotangent*, and *cosecant* of θ. For any given angle there are, then, six trigonometrical functions. It is obvious that these functions are mutually dependent. Indeed, if any one is given the other five can at once be calculated. For instance, the well-known relation $OM^2 + MP^2 = OP^2$ gives at once by dividing by OP^2



$$(\sin.\ \theta)^2 + (\cos.\ \theta)^2 = 1,$$

or, as it is usually written,

$$\sin.^2\theta + \cos.^2\theta = 1.$$

Then, again, the *cosecant* is the reciprocal of the *sine*, and the *secant* of the *cosine*. The *tangent* is the ratio of the *sine* to the *cosine*; and the *cotangent* is the reciprocal of the *tangent*. The sine and cosine are never greater than unity, and the secant and cosecant are never less than unity. The tangent is less or greater than unity according as the angle POM is less or greater than half a right angle.

Suppose OP to rotate counter-clockwise. Then as the angle AOP increases from zero to a right angle the sine evidently grows from zero to unity; while at the same time the cosine diminishes from unity to zero. Continuing the increase so that AOP becomes an obtuse angle, we find that the sine begins to diminish, and that the cosine begins to increase numerically but towards the left of O. In other words, the cosine becomes negative, and continues so until OP has completed three right angles. In the same way, as AOP passes through the value of two right angles and becomes re-entrant, the sine becomes negative, being thenceforward measured downwards until OP has made one complete revolution. After one complete revolution both sine and cosine, and also secant and cosecant, begin to go through exactly the same cycle of changes in magnitude and sign as at first. They are therefore periodic functions (see PERIOD), and their period is 2π or four right angles. The tangent and cotangent, however, go through their cycle of changes in half this period or two right angles. All possible numerical values of the functions are obtained in the first quadrant. It is therefore sufficient in constructing tables of the trigonometrical functions to tabulate for angles from 0° to 90° inclusive. For example, the angle 130° (90° + 40°) has the same sine as the angle of 50° (90° − 40°); and its cosine differs only by being negative. Of greater practical importance than the tables of the functions themselves are the tables of their logarithms. These are generally tabulated for every degree and minute of angle from 0° to 90°; and proportional parts are added by which is readily calculated the number corresponding to an angle involving seconds of arc.

The calculation of the functions and their logarithms is a sufficiently laborious task. It is generally effected by means of Series (q.v.), although the values for certain particular angles can be found by the simplest of arithmetical operations. Thus, the cosine of 60° is evidently $\frac{1}{2}$; sine 60° is therefore $\frac{1}{2}\sqrt{3}$; tangent 60° is $\sqrt{3}$; and so on. What might be called the fundamental series for the sine and cosine in terms of the arc are :

$$\sin.\ \theta = \theta - \frac{\theta^3}{1.2.3} + \frac{\theta^5}{1.2.3.4.5} - \frac{\theta^7}{1.2.3.4.5.6.7} + \ldots.$$

$$\cos.\ \theta = 1 - \frac{\theta^2}{1.2} + \frac{\theta^4}{1.2.3.4} - \frac{\theta^6}{1.2.3.4.5.6} + \ldots.$$

If we make all the signs in these two series positive we get two other functions of θ, which are called the hyperbolic sine and cosine of θ, and are written *sinh.* θ and *cosh.* θ respectively. Related to these functions there are the hyperbolic tangent, cotangent, secant, and cosecant; and they are connected by relations similar to, though not quite identical with, the ordinary circular functions. We may see, by adding the series with signs all positive, that the sum of the hyperbolic sine and cosine is the exponential of θ. Demoivre's theorem gives the corresponding equation for the circular sine and cosine (see DEMOIVRE, and QUATERNIONS). The reason for the names circular and hyperbolic may be partially indicated thus: The relation $\cos.^2\theta + \sin.^2\theta = 1$ may be put in the form $x^2 + y^2 = a^2$, which is the equation of a circle of radius a, referred to rectangular axes (see GEOMETRY). The equation of the rectangular Hyperbola (q.v.) is $x^2 - y^2 = a^2$, to which there corresponds the relation $\cosh.^2\theta - \sinh.^2\theta = 1$. The hyperbolic sines and cosines are really exponential functions, and are not periodic. They are of constant occurrence both in the higher analysis and in mathematical physics. To facilitate their use in calculation, tables have recently been constructed.

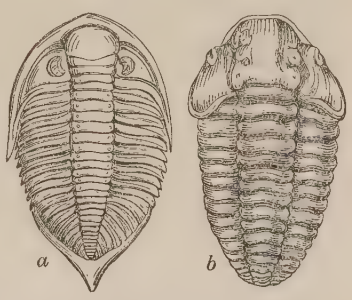
Besides the series given above, there are many others, some of which are particularly serviceable for calculating the values of the functions or the values of their logarithms. There are also the converse series, by which an angle is found in terms of one of its circular functions. One of the simplest, and at the same time most historically famous, of these is Gregory's series, which expresses an angle in ascending powers of its tangent. It is as follows:

$$\theta = \tan.\theta - \tfrac{1}{3}\tan.^3\theta + \tfrac{1}{5}\tan.^5\theta - \tfrac{1}{7}\tan.^7\theta + \ldots.$$

Of great importance are the addition formulæ which express any required function of the sum or difference of two given angles in terms of the trigonometrical functions of these angles. They are readily established for the circular functions by application of the elementary theorems of orthogonal projection. Similar formulæ hold for the hyperbolic functions. As plane trigonometry has to do chiefly with the solution of plane triangles, so spherical trigonometry is devoted to the discussion of spherical triangles. In navigation, geodesy, and astronomy the formulæ of spherical trigonometry are in constant use. The ordinary text-books on trigonometry do little more than present the subject in its practical bearings. An introductory study of the general theorems in analysis which have sprung out of the development of trigonometry will be found in Chrystal's *Algebra* (part ii.). It is impossible to make any progress in the higher mathematics without a thorough knowledge of the properties of the trigonometrical functions.

Trikhala, or TRIKKALA, a town of Greece (since 1881), in Thessaly, 40 miles W. of Larissa, on the slope of a hill, manufactures cotton and woollen stuffs, and has a large transit trade. The neighbouring plains, which are watered by the Salambria (anc. *Peneus*), are rich in fruits. Pop. (1920) 24,005. Trikhala, the *Trikka* of Homer, was celebrated for its temple of Asklepios.

Trilobita, an order of fossil arthropods entirely confined to the Palæozoic rocks. They make their first appearance in the Cambrian, attain a great development in the Silurian, occur sparingly in the Devonian and the Carboniferous, and disappear finally in the Permian system. The dorsal surface of the body was covered with a calcareous shell or crust, which is usually trilobed longitudinally. The body consisted of (1) a head bearing a pair of eyes, a pair of antennæ, and several mouth-parts, and (2) a trunk of numerous segments free anteriorly and united posteriorly in a 'pygidium,' all except the last (telson) bearing biramous appendages. The eyes were invariably sessile and compound, consisting of an aggregation of facets, covered by a thin cornea. The lenses are frequently well preserved, and in some species can readily be seen with the naked eye. Although usually faceted, yet in certain forms the eyes are smooth; while a few species had no organs of sight. The number of facets varies considerably. Thus, while in some types there are not more than fourteen facets, in others there are as many as 15,000 in each eye. The thoracic segments, which vary in number in the different types, were capable of more or less movement, and this to such an extent in some species as to allow of the animal rolling itself up like a hedgehog. Specimens showing the under surface are very rare, but the few which have been found show that the margin of the dorsal crust was turned under in the form of a more or less narrow 'doublure.' In the centre of this doublure in the cephalic region is attached the lip-plate or 'hypostome,' with which, as shown in one specimen, buccal organs (maxillary palpi) seem to have been associated. Other specimens have shown that all the segments of the thorax and tail carried jointed limbs, and that branchial filaments were also present. More recently Dr Walcott, by making thin sections of rolled-up specimens of trilobites, has greatly increased our knowledge of their under surface. He shows (in the case of Calymene) that the mouth, behind the lip-plate, was bounded by four pairs of jointed appendages, the basal joints of which acted as jaws; while the thoracic and pygidial segments each carried a pair of slender jointed legs. To the thoracic segments were likewise attached spiral gills, one row on each side; and probably branchial appendages were also attached to the bases of the thoracic legs. The sexes are believed to be indicated by variations in the breadth of the cephalic shield, and in the length of the cephalic and pygidial spines. The members of the order varied greatly in size, some species being scarcely larger than a pin's head, while others, like *Asaphus gigas*, attained a length of 18 inches, and even sometimes of 2 feet. The eggs of trilobites appear to have been deposited in clusters, but very little is known as to the larval condition of these curious animals. It is possible, as some think, that the young in many species may have been naked, but the dorsal crusts of minute larval forms have been met with, and it is not improbable that many so-called species may be only larval or transition forms of others. Trilobites appear to have swarmed on the muddy bottoms of Cambrian and Silurian seas, although they lived also in regions where only pure limestone was being accumulated. It is now believed that many of the peculiar markings seen upon the surfaces of Cambrian and Silurian strata, some of which have been described as fossil plants, are really the tracks and trails of trilobites and probably other crustaceans. Some doubt exists as to the systematic position of Trilobita, but they are plausibly regarded as entomostracous crustaceans distantly related to the phyllopods. Some authorities regard them as more nearly allied to the Xiphosura (king-crabs).



a, Phacops caudatus; *b*, Calymene blumenbachii.

Trilogy, the name given by the Greeks to a group of three tragedies, either connected by a common subject, or each representing a distinct story. A satyric drama was customarily added as a termination, whence the whole was sometimes termed a *tetralogy*. We possess only one perfect specimen of the classic trilogy—the *Oresteia* of Æschylus (q.v.), which embraces the *Agamemnon*, the *Choephori*, and the *Eumenides*. Schiller's *Wallenstein* is a trilogy, and so are Swinburne's *Chastelard*, *Bothwell*, and *Mary Stuart*.

Trim, the county town of Meath, on the Boyne, 30 miles NW. of Dublin by rail, with imposing ruins of a 12th-century castle, the Yellow Steeple (125 feet) on the site of an ancient abbey founded by St Patrick, and a column to Wellington, who had his first schooling here. Close by are the ruins of Newtown Abbey and the Priory of St John the Baptist, and 5 miles down the

river are the noble ruins of Bective Abbey. Pop. (1926) 1325.

Trimethylamine, $N(CH_3)_3$, incorrectly called propylamine, is an organic base resembling ammonia in some of its properties, and having a strong herring-brine odour. It is obtained principally by distilling herring-brine with lime. It is also prepared from residues from beet-sugar manufacture. It has been employed with success, in doses of 10 to 15 drops, in the treatment of acute rheumatism.

Trimmer, Mrs Sarah, was born at Ipswich on 6th January 1741. Her father was Joshua Kirby, a man of intelligence and piety, who in 1755 removed to London, and became tutor to the Prince of Wales, afterwards George III., in the science of perspective. Here his daughter met Dr Johnson, with whom she speedily became a favourite. In 1759 her father was appointed Clerk of the Works at Kew Palace; and here she became acquainted with Mr Trimmer (1738–92), who married her in 1762, and to whom she bore twelve children. It was not till 1780 that she came before the world, by the publication of her *Easy Introduction to the Knowledge of Nature*—the first of nearly thirty volumes for the young, which, though now forgotten, except *The History of the Robins*, were excellently adapted for their purpose. She died suddenly, 15th December 1810. See her *Life and Writings* (1814).

Trimoda Necessitas. See Trinoda Necessitas.

Trimorphism. See Dimorphism.

Trimûrti (from the Sanskrit *tri*, 'three,' and *mûrti*, 'form') is the name of the Hindu triad, or the gods *Brahmâ* (masculine), *Vishnu*, and *Śiva*, when thought of as an inseparable unity, though three in form. When represented, the Trimûrti is one body with three heads—in the middle that of Brahmâ, at its right that of Vishnu, and at its left that of Śiva. The symbol of the Trimûrti is the mystical syllable *Om* (q.v.). The conception is neither very ancient nor popular, nor has it exerted any influence of importance on Indian thought.

Trinacria. See Sicily.

Trincomalee, a former naval station and magnificent harbour on the north-east coast of Ceylon, 110 miles NE. of Kandy. The town is built on a bold peninsula, which divides the inner and outward harbours. Here the Malabar invaders of Ceylon built the 'Temple of a Thousand Columns,' to which pilgrims flocked from all parts of India. This celebrated shrine was demolished in 1622 by the Portuguese, who fortified the heights with the materials derived from its destruction. It was next held by the Dutch, and subsequently by them and the French alternately, until the capture of Ceylon by the British in 1795. The modern town is in no way remarkable, and, with the exception of the official buildings (barracks, residences of civil, military, and naval authorities), makes a poor appearance, though there is a fine esplanade. The Bay of Trincomalee is landlocked, and presents a scene of tranquil beauty; the harbour is renowned for its extent and security; unlike every other in the Indian seas, it is accessible to every description of craft in every variation of weather, but unluckily it lies out of the course of trade, Colombo having in this respect a great advantage over it. There was an admiralty dockyard, and the fortifications were strengthened shortly before their abandonment (1905). Pop. (1921) 9442.

Tring, an urban district of Hertfordshire, on a spur of the Chilterns, 2 miles W. of Tring station, and 31 NW. of London. Situated near the Icknield Way and the Grand Junction Canal, it has a good church, and some manufactures. Tring Park, built by Wren, is the seat of Lord Rothschild. The second baron established here an important natural history museum. Pop. (1921) 4352.

Tringganu. See Trengganu.

Trinidad is the most southerly of the British West India Islands, being only 7 miles from the coast of Venezuela, the Gulf of Paria (an extremely safe anchorage) lying between. It is about 50 miles long, varying in breadth from 30 to 35 miles, and the area amounts to 1755 sq. m. Three ridges of mountains run east and west, one fringing the north coast and reaching an elevation of 3000 feet. There is a pitch lake near the village of La Brea, about 3 miles in circumference, and 138 feet above the sea; pitch and petroleum fill the hollow, on which a little water floats. Fine mineral oil is obtained from borings, and commercially worked. The soil is very rich and productive. The climate is hot and moist, but not unhealthy; the mean maximum is 87·7°, and the mean minimum 70° F.; and the rainfall is about 74 inches. The chief town, Port of Spain, is one of the finest towns in the West Indies (pop. 65,000). There is another town called San Fernando, with two or three pretty villages. The most important products are cocoa, asphalt, petroleum and petrol spirit, sugar, rum, molasses, coffee, coconuts, tobacco, bitters, and fruit (exported since 1889). The trade is chiefly with Britain and the United States. Oil-bunkering has become important. Pop. (1871) 109,638; (1881) 155,128; (1911) 333,552 (including 20,762 in Tobago); (1921) 365,913, mainly negroes (speaking a French patois), with many East Indian coolies. There are over 120 miles of railway in the island, which with Tobago forms a crown colony, ruled by a governor, an executive council, and a legislative council of twenty-five members (seven elected). The West Indian College of Tropical Agriculture was opened in 1922 at St Augustine, about 7 miles E. of Port of Spain. Trinidad was discovered by Columbus in 1498, but no permanent establishment was founded there until 1532 by the Spaniards. It suffered at the hands of the English (Sir Walter Raleigh in 1595), the Dutch (1640), and the French (1677 and 1690). In 1797 it first fell into the hands of the British, who were confirmed in possession of it in 1802. See West Indies.

Trinidad, a small island in the Atlantic, in 20° 30′ S. lat., and 700 miles E. of the coast of Brazil, to which it belongs. It has been reported to contain pirates' buried treasure. See Knight's *Cruise of the Alerte* (1890).

Trinidad, capital of Las Animas county, Colorado, on the Purgatory River, 210 miles by rail S. by E. of Denver, with mills and a trade in wool. Coal is found close by. Pop. 11,000.

Trinitarians, a religious order founded at Rome in 1198 to redeem Christian captives from the infidels (see Slavery). Their rule was a modification of St Augustine's. They bore a red-and-blue cross on the right breast of their white serge garments. They were bound to devote one-third of their total revenues to the work of redeeming the captives; in the 17th century they claimed to have redeemed from the beginning upwards of 30,000. At the Reformation there were eleven houses in England, five in Scotand, and one in Ireland. The remaining houses of the order in Spain were suppressed in the reign of Isabella II.

Trinitro-compounds, Trinitrotoluene. See Dynamite and other High Explosives.

Trinitrophenol. See Picric Acid.

Trinity, THE DOCTRINE OF THE, is the highest and most mysterious doctrine of most forms of the Christian religion. It declares that there are three Persons in the Godhead, or divine nature—the Father, the Son, and the Holy Ghost, and that these three are one true, eternal God, the same in substance, equal in power and glory—although distinguished by their personal properties. An uncompromising statement of the doctrine is given in the so-called Athanasian Creed, which asserts that 'the Catholic faith is this: That we worship one God as Trinity, and Trinity in Unity—neither confounding the persons nor dividing the substance—for there is one person of the Father, another of the Son, and another of the Holy Ghost. But the Godhead of the Father, and of the Son, and of the Holy Ghost is all one; the glory equal; the majesty co-eternal.'

It is admitted that the doctrine is not found in its fully-developed form in the Scriptures; but it is believed to be clearly revealed in its elements in the New Testament, and also to be indicated in many of the statements and revelations of the Old Testament. The form of expression in speaking of God in the Old Testament Scriptures—the plural *Elohim*, coupled with a singular verb; the apparent distinction recognised in the revelations to the Patriarchs and Moses between Jehovah and 'the Angel of Jehovah;' the mode in which 'the Spirit' and 'Word' of God, and 'Wisdom' (Proverbs viii.) are spoken of; and the gradual unfolding of the doctrine of a 'Messiah,' have all been regarded as indications from the earliest times of the truth of a plurality of persons in the Godhead. In the New Testament Scriptures the doctrine is represented as clearly taught in the Trinitarian formula of baptism, the general character of the claims and prerogatives of Jesus Christ, especially the ascription to Him of the designation 'the Son of God,' and in the functions attributed to the Holy Spirit. The evidence is held conclusive of the equal divine nature and yet distinct personality of the Son and the Spirit along with God the Father. It is generally conceded, however, that the Christians of the 2d and even of the 3d century were far from having a clearly understood and recognised doctrine on this high subject. They were content for the most part to use scriptural expressions in speaking of the Father, and the Son, and the Spirit, without defining articulately their relation to one another. It was not till the progress of opposing heresies sought, on the one hand, to degrade the divine dignity of Christ, or, on the other, to confound the personality of Christ with God the Father, that the church was led to define in its Creeds, Nicene (325 A.D.) and others, the relation of the Son to the Father; the Christological controversies which led to the ultimate definition are discussed at CHRIST. The Constantinopolitan Creed (381) affirmed also the deity of the Holy Spirit; but this church doctrine of a Trinity of Persons was not fully completed till the addition of the *Filioque* clause in the Western Church of the 6th century, which led to the separation of the Greek Church from the Latin (see GREEK CHURCH, CHURCH HISTORY, CREEDS). The Western or Latin Church had less genius for such speculations, and, in so far as it meddled with them, imparted to them a coarser and more contradictory aspect—witness the so-called Athanasian Creed (q.v.). Strenuous assertion of the doctrine of the Trinity occasionally led to what was denounced as tritheism, or doctrine of three gods (so Philoponus in the 6th century). Roscellin was charged with tritheism by Anselm. Scotus Erigena taught a Neoplatonic heretical view; the mystic Richard of St Victor emphasised his view of Trinity as founded on love more than any mediæval teacher.

The Reformers clung to the doctrine as already formulated. Jakob Boehme developed a strangely mystical doctrine. Socinus and modern Unitarians are the most outspoken in their rejection of the doctrine of the Trinity, which has always been specially obnoxious to Deists and advanced Rationalists, and is little insisted on by Broad Church thinkers. Some speculative theologians and philosophers have refined away the Trinity into aspects of God's action rather than *hypostases* or persons as formerly understood. Clarke and the semi-Arians of the 18th century were not trinitarian in the full sense.

Tripartite divisions have had a special charm for philosophers from Plato to Hegel; to some of these the term Trinity has been applied. The Trimûrti (q.v.) is called the Hindu Trinity. Trinities of father, mother, and child (as Osiris, Isis, Horus) are not uncommon.

See the articles ARIUS, ATHANASIUS, SOCINUS, SPIRIT (HOLY), UNITARIANS; books named at DOGMA and THEOLOGY; Dorner's great work; Illingworth, *Doctrine of the Trinity* (1907); and Rendel Harris, *Origin of the Doctrine of the Trinity* (1919).

Trinity, a river of Texas, formed by the union of two forks near Dallas, runs 500 miles SSE. to Galveston Bay.

Trinity College. See DUBLIN, OXFORD, CAMBRIDGE.

Trinity House. The London Trinity House, commonly called the Corporation of Trinity House of Deptford Strond, is responsible for the management of the public general lighthouses, light vessels, buoys, and beacons in England and Wales, with a supervisory authority over local lights and buoys, and a partial control over the public lighting systems of Scotland and Northern Ireland.

In 1514 the corporation, which had already existed as an Association of Mariners for some hundred years, was granted a Charter of Incorporation by King Henry VIII., and its privileges were confirmed and extended by subsequent charters granted by Edward VI., Mary, Elizabeth, Charles II., and James II. The charter granted by King James II. in 1685 is that under which the corporation is now governed, subject to slight modifications under supplemental charters granted by Queen Victoria and King George V.

The Corporation of Trinity House built its first lighthouse at Caister, Norfolk, in 1600, and after this date, as lighthouses increased in number, many of them were built by private individuals under the authority of Royal Patent or Act of Parliament, but by an act passed in 1836 all private rights in public lighthouses were compulsorily acquired by the Trinity House, London. By an Act of Parliament passed in 1853, all light dues formerly collected direct by the Trinity House (as well as by the Scottish and Irish Lighthouse Boards) were ordered to be paid into the Mercantile Marine Fund, from which all disbursements for lighthouses were paid after approval by the Board of Trade. Since 1898 light dues have been paid into a separate fund called The General Lighthouse Fund, controlled by the Board of Trade.

The Removal of Wrecks Act, 1877, and subsequent legislation laid upon the Trinity House the additional duty, in waters adjacent to the coasts of England and Wales where no local harbour or conservancy authority exists, of removing wrecks dangerous to navigation. Trinity House is also the principal pilotage authority for England and Wales, and it licenses the pilots for the London, Isle of Wight, Plymouth, and many lesser pilotage districts, and administers the service in accordance with the Pilotage Act, 1913.

As at present constituted, the Corporation of

Trinity House of Deptford Strond comprises a Master, ten 'active' Elder Brethren, one of whom is Deputy Master, about eleven 'honorary' Elder Brethren, a variable number of retired 'active' Elder Brethren, and an unlimited number of Younger Brethren, the great majority of whom are naval officers or master mariners.

The Master and 'honorary' Elder Brethren are usually Princes of the Blood Royal or distinguished statesmen. The 'active' Elder Brethren are elected by the Court of Elder Brethren from such of the Younger Brethren as are possessed of the necessary qualifications—i.e. in the case of a naval officer to have served afloat actually in command of one or more of His Majesty's ships for at least two years after having attained the rank of commander; and in the case of the Mercantile Marine, to have commanded on foreign voyages for at least three years. The Deputy Master and 'active' Elder Brethren constitute the board which discharges the public and corporate duties of Trinity House.

In addition to the duties indicated above, Trinity House administers extensive charitable funds and maintains a number of almshouses for the benefit of distressed mariners and their dependants. It also possesses certain non-charitable funds, which are applied to the maintenance of its house on Tower Hill, and for purposes of entertainment, for which, of course, the light dues as public funds are not available.

Two of the 'active' Elder Brethren sit with the Judge in the Admiralty Division of the High Court of Justice at the hearing of all cases of collision and in most suits involving salvage claims, their function being to afford expert nautical assistance to the court.

Other Trinity houses at Hull (q.v., instituted 1369), Newcastle upon Tyne (q.v., incorporated 1492), Leith (instituted 1380), Dundee, like in history and originally with similar functions, now exist (except that of Dundee, altogether defunct) only in their charitable capacity.

Trinity Sunday, the Sunday immediately following Whitsunday, so called as being set aside for the special honour of the Blessed Trinity. The festival was not generally observed before the 12th century, though kept in Liége two centuries earlier; only in 1334 was it established by Pope John XXII. as a common festival of the whole Western Church; but the mass and office for the day are older.

Trinoda Necessitas, three species of contributions to which in Anglo-Saxon times all the lands of England were subject—viz. *brycg-bót*, for keeping the bridges and highways in repair; *burh-bót*, for keeping the fortresses in repair; and *fyrd*, for maintaining the military and naval force. Trinōda ('three-knotted') is a modern error for Trimōda ('of three kinds').

Trinovantes, an ancient British tribe, dwelt in Essex, and were Cæsar's allies. In the form Troy Novant (taken to mean New Troy) the name was given to London in the Brut legend.

Trio, in Music, a composition for three voices or for three instruments; also a subsidiary movement, generally in a different key, which follows the main portion of a minuet, scherzo, march, &c., and leads back to it—probably so called from having been formerly written for three instruments.

Triolet, a mediæval French verse form in which the first, fourth, and seventh lines are alike, the third and fifth rhyming with them, and the second and eighth alike, the sixth rhyming with them. It has been practised in English by Robert Bridges and Austin Dobson.

Trional, a well-known hypnotic (see NARCOTICS), is technically a diethyl-sulphone-methyl-ethyl-methane.

Tripe de Roche, a name given to lichens of the genera Gyrophora and Umbilicaria, nutritious but bitter and purgative, used as food by hunters and arctic explorers when better was not to be had.

Triple Alliances. (1) A treaty concluded in 1668 at The Hague between England, Holland, and Sweden, having for its object the protection of the Spanish Netherlands and the checking of the conquests of Louis XIV. (2) An alliance concluded in 1717 between Britain, France, and Holland against Spain. (3) Between Britain, Russia, and Austria in 1795. (4) Between Germany, Austria-Hungary, and Italy, formed and confirmed between 1883 and 1887; ended 1915 by the secession of Italy, which thereupon declared war upon the others. This superseded the 'alliance of the three emperors' (*Dreikaiserbund*) between Germany, Austria, and Russia in 1872–84.—The Triple Entente (1907) was an alliance (at first less complete) between Britain, France, and Russia; the Little Entente, one between Czechoslovakia, Yugoslavia, and Rumania (1921).—For an industrial Triple Alliance see TRADE UNIONS, p. 195.

Tripoli (Arabic *Tarâbulus;* Ital. *Libia Italiana*), an Italian territory, till 1911–12 Turkish, was the easternmost of the Barbary States of North Africa. It is bounded on the W. by Tunis, on the S. (very vaguely) by the Libyan Desert (Fezzan being included), on the E. by Egypt, and on the N. by the Mediterranean Sea. In 1919–20 the boundary from Ghadames (Rhadames), by Ghat (Rhat), to east of Tummo (all of these being already in Tripoli) was smoothed out in Italy's favour by arrangement with France; and Britain agreed that Jaghbub (Jarabub) and the oases of Kufara (the Senûsi headquarters) should be included also in Libia Italiana. To this Egypt assented in 1925, in exchange for a slight rectification of the frontier at Sollum. The area is roughly estimated at 500,000 sq. m.; the population, which is very mixed—Libyan Berbers, Arabs, negroes, some Europeans (chiefly Italians, and Maltese) and Jews—was returned in 1921 as 550,000 (20,000 Europeans) for Tripolitania; 235,000 (10,000 Europeans) for Cyrenaica. Tripoli is divided into the administrative districts of Tripolitania (capital, Tripoli) and Cirenaica (capital, Bengazi), the ancient Cyrenaica (q.v.; and see BARCA), and is less mountainous than the rest of Barbary, for the Atlas range terminates here in a couple of chains running parallel to the coast and never exceeding 4000 feet in height. The sponge-fishery is valuable. There are no rivers, and rain seldom falls during the long hot summers, but the heavy dew supports vegetation in favoured spots. The climate is extremely uncertain. The coast region (about 1100 miles in length) is very fertile about Tripoli and Mesurata, where all sorts of sub-tropical fruits, grain, wine, cotton, madder, &c. are produced; but further east, along the shores of the Gulf of Sidra, reigns sandy desolation. There are tunny and sponge-fisheries. Esparto grass is an important crop. The interior yields senna, dates, and galls, and the carob and lotus are indigenous. Sheep and cattle are reared in great numbers, and there is a hardy breed of small but excellent horses, besides strong and beautiful mules. The commerce of the country consists in exporting, principally to Italy, Malta, and the Levant, the products of the country and of the interior of Africa (gold-dust, ivory, natron, and ostrich feathers), which are brought hither in caravans across the desert. The imports declined with the abolition of the slave-trade. Nevertheless, Tripoli is still a mart of the caravan trade with the interior. Each of the two provinces has a governor and parliament, Italians and natives having equal rights.

From the Phœnicians Tripoli passed into the hands of the rulers of Cyrenaica (Barca), from whom it was wrested by the Carthaginians. It next belonged to the Romans, who included it within the province of Africa, and gave it the name of *Regio Syrtica*. About the beginning of the 3d century A.D. it became known as the *Regio Tripolitana* (on account of its three principal cities, Œa, Sabrata, and Leptis, which were leagued together), and was probably raised to the rank of a separate province by Septimius Severus, who was a native of Leptis. Like the rest of North Africa, it was conquered by the Arabs early in the 8th century (see BARBARY), and the feeble Christianity of the natives was supplanted by a vigorous and fanatical Mohammedanism. In 1510 it was taken by Don Pedro Navarro for Spain, and in 1523 it was assigned to the Knights of St John, who had lately been expelled by the Ottoman Turks from their stronghold in the Island of Rhodes. The Knights kept it with some trouble till 1551, when they were compelled to surrender to the Turkish admiral Sinan (see Lane-Poole, *Barbary Corsairs*), and Tripoli henceforward joined in the general piracy which made the Barbary States the terror of maritime Christendom. In 1714 the ruling pasha, Ahmad Karamânlî, assumed the title of bey, and asserted a sort of semi-independence of the sultan, and this order of things continued under the rule of his descendants, accompanied by the most brazen piracy and blackmailing, until 1835, when the Porte took advantage of an intestinal struggle in Tripoli to reassert its authority. A new Turkish pasha, with viceregal powers, was appointed, and the state was made a vilâyet of the Ottoman empire. Several anti-Turkish rebellions (notably in 1842 and 1844) were suppressed. The religious movement set on foot by the prophet Senûsi in the middle of the 19th century is one of the most remarkable features in the recent history of Tripoli. The first Senûsi died in 1860, and was succeeded by his son (1847–1902), called the Mahdi, who commanded the devotion of a large following in northern Africa, much as did the better-known Mahdi in the Sudan (see SENUSSI). Italy's ambitions in North Africa led her into war with Turkey in 1911. Tripoli was invaded, and annexed. The treaty of Ouchy (1912) left it practically an Italian possession. The Italian hold upon it was slight until after the treaty of Lausanne (1923). See FEZZAN.

Tripoli, probably the *Œa* of antiquity, called in Arabic *Tarâbulus*, or *Tarâbulus Gharb* ('Tripoli of the West'), is the capital of the foregoing province, and lies on the edge of the desert, on a point of rocky land projecting into the Mediterranean and forming a bay. It is a typical Moorish city, irregularly built, surrounded by high bastioned walls, and celebrated for its beautiful gardens. There are many mosques, besides several large churches. The harbour, water-supply, and sanitation have been improved during Italian administration. Pop. about 65,000. Though the majority of the inhabitants are Moslems, nearly all the trade is in the hands of Jews and Christians.

Tripoli (*Tarâbulus*, or *Atrâbulus*), a port of the French mandatory state of Lebanon, 40 miles NNE. of Beirut, is watered by a small stream, the Kadîsha. In and around the town are many remains of antiquity and traces of Saracenic architecture. Originally an important maritime city of Phœnicia, the ancient *Tripolis* was besieged and taken by the Crusaders in 1104, and retaken by the Mameluke Kalaûn in 1289. The old town having been laid in ruins by these sieges, a new one was built about 5 miles inland on a spur of the Lebanon range. It was famous in the middle ages for its fruit and gardens, its commerce and industries. The old harbour is small and shallow. Pop. 27,000.

Tripoli (Diatomite), a mineral substance employed in polishing metals, marble, glass, &c., so named because it was originally brought from Tripoli in Africa. It is a siliceous rock, composed of the siliceous frustules of Diatomaceæ. It is frequently soft, friable, and earthy, but now and then is rendered firmer and more solid, and even extremely hard, probably from impregnation with opal substance. The more dust-like varieties are called *Kieselguhr*, and are in much demand for the manufacture of Dynamite (q.v.). Kieselguhr has been met with in alluvial (generally lacustrine) deposits in many countries. It occurs in beds underneath peat in Britain, Norway, Germany, &c. Diatomaceous deposits are forming at the present day both in fresh water and in the sea: those which are worked for economic purposes ranging in age from Tertiary to recent times. Ehrenberg estimated that every cubic inch of Bilin Tripoli weighing 220 grains contained 41,000,000,000 of these minute water-weeds.

Tripolis ('three cities'), sometimes called Tripolitza, a town of Greece, capital of the Morea, now of Arcadia, 40 miles SW. of Corinth, in a plain 3000 feet above the sea. It is a comparatively modern place, and derives its name from being near the sites of the three ancient cities Tegea, Mantinea, and Pallantium. In 1821 it was stormed by the Greek insurgents, and in 1828 razed to the ground by the troops of Ibrahim Pasha. Pop. 14,000.

Tripolje Culture. See ART, p. 459.

Tripos. See CAMBRIDGE.

Triptolemus, a Greek culture-hero, associated with Eleusis and the introduction of agriculture.

Triptych (Gr. *tris*, 'thrice,' and *ptyssō*, 'I fold'), a set of tablets consisting of three leaves, each painted with a distinct subject, but joined together by hinges, and capable of being folded so as to present a new face. The general character of such tablets has been explained under DIPTYCH (q.v.), the difference of name 'triptych,' 'polyptych,' being taken from the number of the leaves. In ecclesiastical use the diptych has been already explained as commonly meaning rather the register of names inscribed on the tablets than the tablets themselves. The triptych, on the contrary, generally speaking, contained sacred pictorial representations rather than written registers or records, and is extended to canvas pictures in three compartments. Famous triptychs are an altarpiece of the Van Eycks (q.v.) and the 'Descent from the Cross' by Rubens.

Trireme (Lat. *triremis*; Gr. *triērēs*), an ancient galley—especially a war-galley—having three banks of oars. Originally boats with one bank, then with other two banks of oars, were used. In the Persian and Peloponnesian wars triremes were the largest vessels employed; but at the time of Alexander we find that galleys with four and five banks had gradually come into favour. In the Punic wars the Carthaginians employed quinqueremes; and thenceforth the Romans constructed their war-vessels after the model of the Carthaginian quinquereme. At Actium Antony had nine and ten banked galleys. Under the empire the police of the seas was managed by smaller vessels, *liburnæ*; great war-ships were hardly required.

The banks of oars were elevated above each other, but not perpendicularly; the lowest rank of rowers having the shortest oars and easiest work. How the banks of rowers were arranged as to allow all to have a fair share of the work has never been satisfactorily explained. The trireme or quin-

quereme was also provided with a square sail, which was used when the wind was favourable for voyaging to relieve the labour of the rowers, but was not employed in action. In the earlier times victory depended more upon the number and valour of the soldiers on board than upon the skill of the seamen. Latterly the aim of each trireme was not as before to grapple with its opponent, but to dash with the greatest momentum possible with its beak against the enemy's vessel, and strike it amidship, or, at any rate, disable his banks of oars on one side. Fighting men were not so much wanted for these tactics. The crew then of an Athenian trireme consisted of about 200 men, of whom 20 might be sailors, nearly the same number marines, and the rest rowers. A contrivance for strengthening the prow of the trireme and increasing its efficiency as a ram gave the Syracusans their final victory over the Athenians in the harbour of Syracuse. The Romans preferred to grapple and fight hand to hand. See GALLEY.

Trisagion, or TRISHAGION (Gr. *tris*, 'thrice,' and *hagios*, 'holy'), one of the doxologies in use in the Greek Church which is repeated in the form of versicle and responses by the choir in certain parts of the liturgy. The words of the Trisagion are: 'O holy God, holy and mighty, holy and immortal, have mercy on us!' This doxology occurs in the Constantinopolitan and Syriac liturgies, in the Good Friday service of the 'adoration of the Cross,' and in the ferial prayers at Prime for penitential days.

Trismegistus (Gr., 'Thrice-greatest'), an epithet applied to the Egyptian Hermes; see HERMETIC BOOKS.

Trismus Nascentium. See TETANUS.

Tristan. See TRISTREM.

Tristan da Cunha (sometimes erroneously *Tristan d'Acunha*), an island in the South Atlantic Ocean, with two smaller ones adjoining, lies midway between the coast of South America and the Cape of Good Hope, in 37° 6′ S. lat. It is about 21 miles in circumference, is rugged and precipitous, rising in a central conical mountain to 7640 feet. Discovered by the Portuguese in 1506, and named after the commander of the expedition, it was occupied by American sealers in 1790–1811. Formal possession was taken of the island in 1817 by a company of British artillery for the purpose of keeping a watch upon Napoleon, at that time a prisoner at St Helena. On the death of Napoleon in 1821 the soldiers were withdrawn, with the exception of a corporal Glass and two companions, who, with some whaling men, were the founders of the present settlement. The colony flourished, and in 1829 numbered 27 souls; in 1873 there were 80, with 600 cattle and 600 sheep. Nearly all the able-bodied men were drowned in December 1885 while attempting to board a vessel. In 1887 there were 97 persons, in 1903 only 75, the population having decreased through migrations to the Cape; in 1920, 130. During the American war the *Shenandoah* landed forty Federal prisoners here without providing for them. The settlement is in a fertile tract to the north-west, and is called Edinburgh. Property is practically held in common, and there is no strong drink and no crime, while the natives, notwithstanding in-breeding, are healthy and long-lived. They have cattle, geese, potatoes, and they catch fish. Removal of the population, or its surplus, to South Africa, has been thought of from time to time, as in 1926. Inaccessible Island, 20 miles distant, harboured two Germans of the name of Stoltenhoff, who underwent a kind of Robinson Crusoe experience there (1871–73). It has been suggested that it should be colonised from Tristan da Cunha. Nightingale Island lies 10 miles from Inaccessible Island. Further off, to the SE., is Gough Island, or Diego Alvarez, uninhabited. See Mrs Barrow, *Three Years on Tristan da Cunha* (1910); Rogers, *An Outpost of the Atlantic* (1922); Mrs Rogers, *The Lonely Islands* (1926).

Tristrem, or TRISTAN, the hero of a Breton or Cornish romance, originally unconnected with the Round Table cycle, although later interwoven with it. Tristrem was the love-child of King Mark of Cornwall's sister and Roland of Ermonie, and at fifteen repaired to Cornwall, where he charmed the whole court by his minstrelsy. He slew Morannt in mortal combat, and lay ill three years of the wounds received, but was borne to Ireland, and there cured by Ysolt or Ysonde, daughter of the queen. On his return to Cornwall he told his uncle of the marvellous beauty of the Irish princess, and was sent to solicit her hand for him in marriage. Tristrem escorted Ysonde on her voyage to England; but both unwittingly drank of a love-potion intended for Mark, and from that day to the day of their death no man or woman could come between their loves. Ysonde was married to the king of Cornwall, but by the help of her clever maid, Brengwain, had many a secret interview with her lover. Tristrem was banished from Cornwall, but again brought to his uncle's court, and again their inevitable loves began anew. Next he wandered to Spain, Ermonie, Brittany, and here married another Ysonde—her with the white hand, daughter of Duke Florentine—but he could not forget his love for Ysonde of Ireland. Grievously wounded in battle, he sent a messenger to bring her to him. 'If you bring her with you,' he charged him, 'hoist a white sail; if you bring her not, let your sail be black.' Soon the ship is sighted, and Tristrem asks eagerly what is the colour of her sail. It was white; but Ysonde of Brittany, her heart filled with bitter jealousy, told Tristrem the sail was black, whereupon the heart-sick lover sank back and died. Ysonde of Ireland threw herself in passionate despair upon his body, and died heart-broken beside him. King Mark subsequently learned the story of the love-potion, and buried the twain in one grave, planting over Ysonde a rose-bush, and over Tristrem a vine, which grew up so inextricably intertwined that no man could ever separate them.

This romantic story is beyond a doubt of Celtic origin, but its intrinsic beauty early carried it widely across western Europe. It had very probably a mythological origin, and it recalls in more than one point the legend of Theseus. The oldest poems on the subject, extant only in fragments, were written in French in the 12th century by Béroul and by Thomas. Thomas at least was almost certainly an Englishman, and a poet of genius. About the end of the 12th century Eilhard of Oberge composed his *Tristrant* (Strasb. 1877), the ultimate parent of many versions in later German *Volksbücher*. Gottfried of Strasburg's unfinished translation of Thomas, in almost 20,000 lines, belongs to the first quarter of the 13th century. Soon after Gottfried's death his fine poem was feebly continued by Ulric of Türheim and Henry of Freiburg. The extant English poem, *Sir Tristrem*, dates from about the close of the 13th century. It was first edited by Sir Walter Scott in 1804; later by Eugen Kölbing (Heilbronn, 1882), and George P. M'Neill for the 'Scottish Text Society' (1886). Scott ascribed the authorship to Thomas the Rhymer (q.v.), and was followed by Mr M'Neill. In the 13th century also a Norse version was made, *Tristrams Saga ok Ísondar* (edited by Eugen Kölbing, Heilbronn, 1878). We find allusions enough to the story in French *fabliaux*, in Dante, Petrarch, Boiardo, and Ariosto, in Chaucer, Lydgate, and Gower; in 1469 a prose romance on the subject

of Tristan, son of King Meliadus of Leonnois was printed at Rouen, and was soon translated into German. The Spanish romance of *Don Tristan of Leonis* appeared at Seville in 1528; the Italian, *I due Tristani*, at Venice in 1555. It also became associated with the romances of the Round Table, and we find it in its place in Sir Thomas Malory's famous composition of these, the *Morte Darthur*. Hans Sachs worked the subject into a tragedy, and in 1588 a long poem on the love of Tristano and Madonna Isotta was printed at Venice. In 1841 appeared Karl Immermann's unfinished *Tristan and Isolde;* Wagner's operatic poem was first produced in 1859. A later work is the tragedy by Ludwig Schneegans (1865). In modern English poetry we have Matthew Arnold's poem, *Tristram and Iseult;* 'The Last Tournament' in Tennyson's *Idylls of the King*, closely based on Malory; Swinburne's *Tristram of Lyonesse;* Masefield's play, *Tristan and Isolt;* and E. A. Robinson's *Tristram* (1927).

See editions of Thomas by Bédier (1902–5), of Béroul by Muret (1904, 1914); studies of the Tristram saga by Golther (1887), G. Paris (*Poèmes et Légendes*, 1900), Block (*Neueren Sprachen*, 1908), Schoepperle (1913); the modern French translation of Thomas by Herbomez and Beaurieux (1912); *Hist. littéraire de la France*, vol. xxx. (1888); *Romania*, vols. xv. and xvi.; A. Bossert, *Tristan et Iseult* (1902); and books cited at THOMAS THE RHYMER, &c.

Triticum. See WHEAT, and COUCH-GRASS.

Tritoma, or FLAME-FLOWER. See KNIPHOFIA.

Triton, in Greek Mythology, a son of Poseidon and Amphitrite, who dwells with his parents in a golden palace at the bottom of the sea. He usually figures as an attendant on his father, a man in his upper parts with a dolphin's tail, and soothing the turbulent waves by blowing his shell-trumpet—his 'wreathed horn,' as Wordsworth calls it. The later poets speak of Tritons, in the plural, as a race of subordinate sea-deities, who are described by Pausanias as having sea-green hair and eyes, gills below the ears, human noses, broad mouths with the teeth of animals, scales on their bodies, and instead of feet a tail like that of a dolphin. Some have a dolphin's tail and horse's fore-feet (*Centauro-tritons*).—In zoology the name is given to the Newt, and to a genus of Gasteropods.

Triumfetta, a tropical genus of Tiliaceæ, herbs and shrubs, with hooked fruits for animal-distribution, and often nectaries at the bases of the leaves. Some species (*T. semitriloba*, *T. criocarpa*) yield fibre, which is used for coffee bags.

Triumph (Lat. *triumphus*) was the name given in ancient Rome to the public honour bestowed on a general who had been successful in war. It consisted in a solemn procession along the *Via Sacra* up to the Capitol, where sacrifice was offered to Jupiter. The victor stood in a chariot, drawn by four horses—his captives marching before, his troops following behind.

The *ovation* (from *ovare*, 'to shout,' 'exalt'), or lesser triumph, differed from the greater chiefly in these respects, that the imperator entered the city on foot, clad in the simple *toga prætexta* of a magistrate, instead of the *toga picta* and the *tunica palmata* of the more highly honoured commander, that he bore no sceptre, was not preceded by the senate and a flourish of trumpets, nor followed by his victorious troops, but only by the equites and the populace. The ovation was granted when the success, though considerable, did not fulfil the conditions specified for a triumph, or if the conqueror had not been in supreme command. For triumphal arch, see ARCH.

Triumvirate (Lat., 'a union composed of three men') is the name given in Roman history to the private league entered into by Pompey, Crassus, and Cæsar to carry out their own schemes of political aggrandisement, in spite of the opposition of the senate. The term is also applied to the division of government between Octavian (Augustus), Mark Antony, and Lepidus in the civil wars that followed the murder of Cæsar—an arrangement sanctioned, and therefore legalised by the senate.

Trivandrum, capital of Travancore (q.v.); pop. (1921) 72,784.

Trivet or TREVET, NICHOLAS (*flor.* 1300), an English Dominican friar, who wrote *Annales Sex Regum Angliæ*, covering the period 1136–1307, and other historical works.

Trivium. See ARTS.

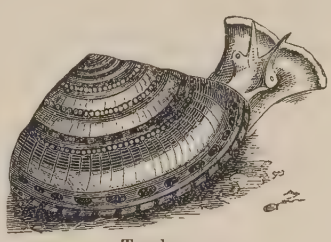
Trnovo, a town of Bulgaria, on the Jantra, 35 miles SSE. of Sistova, amidst strange limestone rocks. It became in 1235 the seat of the Bulgarian patriarch, and has more than once served as the capital. Dyeing is carried on, and silk and coarse cloth are manufactured. Pop. 13,000.

Troad, the district around Troy (q.v.).

Trocar. See CANNULA.

Trochee, in classical prosody a foot consisting of a long syllable followed by a short, extended in modern language to a stressed followed by an unstressed.

Trochidæ, a family of vegetarian gasteropods. The shell is conical, spiral, nacreous; the aperture is entire and closed by a thin horny operculum. In the genus Trochus the shells are top-shaped, and hence are popularly known as Top-shells. Many of the shells are extremely beautiful, and are used for adorning head-dresses, necklaces, &c., the outer layers being removed. The family includes a large number of British species, and a multitude of foreign and fossil forms. The Trochidæ are closely allied to the Turbinidæ.



Trochus.

Trochilus. See HUMMING-BIRD.

Trochu, LOUIS JULES, the defender of Paris, was born at Palais in Belle-Isle (Morbihan), 12th May 1815, and after the course at St Cyr entered the army at seventeen, and by his conduct and capacity rose rapidly in rank. He served as adjutant to Lamoricière, and to Bugeaud in Algeria; next to Saint-Arnaud and Canrobert in the Crimea, became in November 1854 general of brigade, and distinguished himself next year in the storming of the Malakoff. As general of division he fought at Solferino, and after the peace entered the Ministry of War, and was destined by Niel for his successor. But the unpalatable truths contained in his famous pamphlet, *L'armée Française en 1867*, in which he pointed out the rottenness of the imperial military system, and urged the adoption of Prussian methods, made him hateful to the court. At the outbreak of the 1870 war he received command of the 12th Territorial Division at Toulouse, and on the 17th August was named by the emperor governor of Paris, and after the proclamation of the republic became chief of the National Defence. He was cautious, timid, said the hotter spirits both within and without the circle of the doomed city; it is most probable that he saw only too well the hopelessness of his task. He laid down

his office as governor 22d January 1871, but remained president of the National Defence till 1872, and died 7th October 1896. Works in his own defence are *Pour la Vérité et pour la Justice* (1873) and *La Politique et le Siége de Paris* (1874). See his *Souvenirs Posthumes* (2 vols. 1896).

Troctolite (trout-stone), a variety of Gabbro (q.v.) composed almost entirely of white felspar (labradorite) and dark olivine. It is the 'Forellenstein' of the Germans.

Trœzen, a very ancient Greek city, capital of the south-east district of Argolis. It was the birthplace of Theseus (q.v.).

Troglodytes (Gr. *Trōglodytai*, 'cave-dwellers'), the name given by the ancient Greeks to various tribes or races of uncivilised men, who dwelt either in natural caverns or in holes which they had dug for themselves in the earth. They are mentioned by Strabo as existing as far west as Mauretania, and as far east as the Caucasus; but perhaps the best-known Troglodytes of ancient times were those of southern Egypt and Ethiopia. It was reported that they could not speak articulately, but shrieked or screamed like the lower animals. The chief occupation of the Troglodytes was herding cattle, though we also read that they were hunters and robbers. They are likewise mentioned as serving among the light troops in the army of Xerxes. Their habits of life were rude and debased; their drink was a mixture of milk and blood; they had a community of wives; and they killed the old men when unfit to tend cattle. Troglodytes are mentioned by Herodotus, Aristotle, and Diodorus, and seem to have been found also in Mœsia. The prehistoric cave-dwellers of Europe and more recent cave-dwelling peoples are noticed at CAVE.

Trogons (*Trogonidæ*), a family of birds of the order Picariæ, not very closely allied to any other group. They have the bill short, broad, notched or serrated, and with a wide gape; the feet small and weak, with the toes in pairs; but the first and second toes are turned backward, instead of the first and fourth—an arrangement unique among birds. The wings are short and somewhat pointed; and the tail is long and broad, often overhung by long tail-coverts. The plumage is soft, lax, and loosely attached to the very delicate skin; it is very beautifully coloured, some species being only excelled in brilliancy by the humming-birds. The females are less gorgeous than the males. The trogons inhabit the tropics of the old and new worlds; they are most numerous in South America, less so in the oriental region, and are represented in Africa by two species only. They are birds of moderate size, and sedentary and unsocial habits, inhabiting forests, where they sit motionless on branches, occasionally darting off to seize fruits or insects. They nestle in holes in decayed trees, laying two to four eggs, white or pale in colour. There are about fifty species, of which the most celebrated is the Quetzal, or Resplendent Trogon (*Pharomacrus mocinno* or *Calurus resplendens*), whose plumage is of a magnificent golden green, the centre tail-coverts of the male being nearly three feet long, though the bird is only of the size of a magpie. It inhabits Central America: Guatemala especially is the 'Land of the Quetzal.' See Gould's *Monograph of the Trogonidæ* (2d ed. 1875), and Brigham's *Guatemala* (1887) and for the significance of the Quetzal in political and religious symbolism, *Zeitsch f. Ethnologie* (1909).

The Quetzal (*Pharomacrus mocinno*).

Troilus and Cressida. See TROY.

Trois Rivières. See THREE RIVERS (Quebec).

Troitsk, a town of Russia, on the Siberian side of the mountains, is 400 miles NE. of Orenburg, on the great road into Siberia; pop. 35,000.

Troll. See DEMONOLOGY.

Trollhättan, a village of Sweden, 9 miles S.W. of Venersborg, with famous waterfalls.

Trollius. See GLOBE-FLOWER.

Trollope, the name of a family which has produced several eminent English authors.—MRS FRANCES TROLLOPE was a novelist and miscellaneous writer. Born in 1780 at Stapleton, near Bristol, the daughter of the Rev. William Milton, and brought up at the vicarage of Heckfield, Hants, in 1809 she was married to Thomas Anthony Trollope, a barrister-at-law and fellow of New College. In 1829, her husband having fallen into very straitened circumstances, she went to America; and during a three years' residence in the United States she amassed the materials of her first book, *Domestic Manners of the Americans*, published in 1832. This work attracted great attention, and the severity of certain of its strictures was much resented by Americans. From this time forward the literary activity of Mrs Trollope was nearly uninterrupted; novels of society and impressions of travel make up the sum of her works. Of her novels the most successful is, perhaps, *The Widow Barnaby* (1839), with its sequel, *The Widow Married* (1840), followed by *The Barnabys in America*. Mrs Trollope was a woman of strong talent, and her 115 volumes are full of shrewd observation and true, if at times somewhat coarse, humour. They were popular in their day, and very well deserved their popularity; but they were soon well-nigh forgotten. During the life of her husband Mrs Trollope resided chiefly at Harrow. Latterly much of her time was passed in Italy with her eldest son; she died at Florence, 6th October 1863. See Life by her daughter (1895).

Her son, THOMAS ADOLPHUS TROLLOPE (29th April 1810–13th November 1892), was educated at Winchester and Oxford, and in 1841 settled in Italy. He is favourably known by his *Girlhood of Catherine de' Medici*, *A Decade of Italian Women*, and a number of novels such as *La Beata*, *Marietta*, *Lindisfarn Chase*, *Gemma*, *The Garstangs*, *The Dream Numbers*. He also wrote a *History of Florence*, the *Life of Pius IX.*, *Sketches of French History*, &c. His second wife, Mrs Frances Eleanor Trollope, wrote *Aunt Margaret's Trouble* (1866), *Black Spirits and White* (1877), *That Unfortunate Marriage* (1888), and, with her husband, *The Homes and Haunts of the Italian Poets* (1881). See his autobiographical *What I Remember* (3 vols. 1887–89).

The third son, ANTHONY TROLLOPE, in his time one of the most popular of novelists, was born 24th April 1815, and was educated at Winchester and Harrow. In 1841 he obtained a post as clerk to a surveyor of post-offices in Ireland. Here he acquired the fondness for hunting which never left him, married (1844), and began writing novels; and while filling responsible situations in the Post-office, he found, or made, leisure to amuse

the public with a long series of novels, many of them of very remarkable merit. The *Kellys and the O'Kellys* (1848) was one of the first three novels he wrote. All three fell dead from the press, although they presented a graphic and accurate picture of the Irish life of the time. The first work which decisively drew attention, *The Warden* (1855), was followed by a continuation, *Barchester Towers*, which remains, perhaps, the cleverest of all his books. In rapid succession to these came *Doctor Thorne*, *The Bertrams*, *The Three Clerks*, *Castle Richmond*, *Framley Parsonage* (originally published in the *Cornhill Magazine*), *Orley Farm*, *The Small House at Allington* (contributed to the *Cornhill Magazine*), *Rachel Ray*, *Miss Mackenzie*, *Can You Forgive Her?* *The Claverings*, and *The Last Chronicle of Barset* (1867)—one of his best novels—besides many others. He was a zealous and valuable servant of the Post-office, and resigned his position as a surveyor (1867) three or four years only before he would have been entitled to a retiring pension, because he felt that his increasing literary work made it impossible for him, even with his extraordinarily unflagging industry, to discharge his official duties with efficiency. He wrote much for the magazines, and was the first editor of *St Paul's;* he once stood for parliament and was defeated. Post-office work had taken him to the West Indies, Egypt, and the United States; latterly he travelled in Australia and South Africa; so that he acquired materials for books on all these countries. Novels continued to be produced with astonishing regularity and frequency, according to a business-like method he has described in his autobiography. Amongst novels written subsequent to his resignation were *Phineas Finn* (1869), *Ralph the Heir*, *The Golden Lion of Granpère*, *Phineas Redux*, *John Caldigate*, *Ayala's Angel*, *The Fixed Period*, and *An Old Man's Love* (1884). Other works were a sketch of Thackeray (1879), a Life of Cicero (2 vols. 1880)—a task for which his powers were inadequate—and a short Life of Palmerston (1882). He died 6th December 1882. His interesting *Autobiography* (1883) was edited by his son, H. M. Trollope, author of novels and other works. See books by Escott (1913), and Sadleir (1927), the latter accompanying a revival of interest in Trollope.

Tenor Trombone.

Tromba Marina, so called from its resemblance in shape to a speaking-trumpet, and its trumpet-like compass and tone, was a musical instrument of the Viol (q.v.) class, much used by nuns (called therefore *Nonnengeige* in German). It had usually one string, and was played in harmonics with a heavy bow. The bridge was unsymmetrical.

Trombone (Ger. *Posaune*), a brass musical wind-instrument, whose title, originally Italian, signifies the great tromba or Trumpet (q.v.), to which instrument it forms the natural complement. It consists of a tube bent twice on itself, ending in a trumpet-shaped bell, and sounded by means of a cupped mouthpiece. The centre section (*a* in fig.) is double, the outer tube sliding on an inner one so as to permit of its being stretched to nearly double its own length. The performer, while holding the mouthpiece with the left hand, moves the slide out and in with the right hand by means of the cross-piece, *b*. The bass form of the instrument is provided with a jointed handle to enable the performer to reach the end of the slide. The notes of the trombone are not fixed like those of the valved instruments, but are made by the performer as in the case of the human voice or the violin. The seven positions of the slide allow the performer to alter the pitch of the instrument down to the extent of seven semitones, while the available harmonic scale in each position extends to about an octave (see HARMONICS). The total compass is therefore about 2½ octaves, and all the notes are of the same quality. There are three sizes of trombones in common use, the alto in E♭ (on the lowest line of the treble clef), the tenor in B♭, and the bass in G or F. The trombone is of ancient but uncertain date; by the 14th century a brass instrument with a double slide was in use (see SACKBUT). The supposed discovery at Pompeii in 1738 of specimens made of bronze, with gold mouthpieces, is now quite discredited. Bach wrote for the trombone, but its general use declined in the 18th century, and was revived in the 19th. Mozart and Beethoven sometimes included it in their orchestra, and Schubert and Weber nearly always. The tone of the trombone is rich and impressive, especially when played softly, or in large numbers together in the open air. In military music it is unrivalled. Trombone bands have been formed in Germany.

Tromp, MARTIN HARPERTZOON, a famous Dutch admiral, was born at Briel in 1597, went to sea as a child with his father, a commander in the Dutch navy, was captured off the coast of Guinea by an English cruiser, and compelled to serve over two years as a cabin-boy. In 1624 we find him in command of a Dutch frigate; in 1637 he was created lieutenant-admiral, with command of a squadron of eleven ships, with which he defeated a vastly superior Spanish fleet off Gravelines in February 1639. In the following October he defeated another fleet off the Downs, and captured thirteen richly laden galleons. But it was his conduct in the struggle with England that was to make the name of Tromp immortal. On May 19, 1652, with over forty ships, he encountered an English fleet of fifteen under Blake, and was worsted, with the loss of two ships. Tromp was for a while superseded in command by Ruyter and De Witt, but he was soon afterwards reinstated. On November 30, with eighty ships and a convoy of 300 merchantmen, he again encountered Blake in the Strait of Dover, and this time success was decidedly with the Dutch. The English fleet drew off, but it more than probably is a mere romance that Tromp now sailed up the Channel with a broom at his masthead, to denote that he had swept the enemy from the seas. At any rate that enemy was not long in returning. On the 18th of February 1653 Blake, together with Monk and Deane, engaged Tromp near Portland, and defeated him, though only after a contest memorable for its obstinacy. It lasted three days, at the close of which Blake had taken or destroyed nine ships of war and thirty merchantmen. Tromp fought with desperate courage, and brought off in safety the remainder of his convoy of 200 merchantmen. On June 2 and 3 following another terrific battle between Tromp and Deane took place off North Foreland, in which six Dutch vessels were captured, eleven sunk, and the remainder driven into Calais Roads. The final struggle of the war was his desperate battle with Monk, 31st July 1653, off the coast of Holland. The Dutch lost thirty men-of-war, but their greatest loss was the heroic Admiral Tromp, the victor in thirty-three sea-fights, killed by a bullet through the heart. He was buried at Delft. —His second son, CORNELIUS TROMP, was born at Rotterdam, 9th September 1629. His first service

was against the Algerine pirates. Next he served under Van Galen in the Mediterranean, and became rear-admiral after the battle off Leghorn in which Van Galen fell (13th March 1653). On June 3, 1665, he shared the disgrace of Opdam's defeat by the Duke of York at Solebay on the Suffolk coast, but next year had an ample share of the glory of Ruyter's four days' fight (June 1–4) off the Downs. Two months later he was deprived of his command by Ruyter for a breach of duty, the result of his over-eagerness to pursue an advantage, but was reinstated in 1673 by the stadhouder William, and covered himself anew with glory in the bloody battles against the combined English and French fleets, 7th and 14th June. In 1675 he visited England, and was created a baron by Charles II. The year after he aided the Danes in their struggle with Sweden, and after his return home was appointed, in room of the dead Ruyter, lieutenant admiral-general of the United Provinces. He died at Amsterdam, 29th May 1691, and was laid at Delft in his father's grave. See Jacob de Liefde, *Great Dutch Admirals* (Eng. trans. 1873).

Trompe. See BLOWING-MACHINES.

Tromsö, a town of Norway, capital of Troms (the north-west part of the kingdom), on the eastern shore of the low, fertile island of Tromsö, which is nearly 5 miles long, and about 1½ mile broad; pop. (1920) 10,071.

Tron or TRONE weight, the most ancient system of weight used in Scotland, the *trone* (Gr. *trytanē*) being a heavy beam or balance set up in the market-place, and employed for the weighing of heavy wares and the punishment of offenders, who were nailed to it by the ear. The tron lb. contained 20 oz., but, from the custom of giving 'one in' to the score, was usually reckoned at 21 oz.; but it varied in the different market-towns between this and 28 oz. The later tron stone or standard weight contains 16 tron lb., each lb. 16 tron oz., and each tron oz. 16 drops; the tron lb. is estimated to be equivalent to 1·3747 lb. avoirdupois. The name survives in several Scottish churches.

Trona. See NATRON.

Trondhjem (also *Throndhjem;* Ger. *Drontheim*), on the south side of the long and narrow Trondhjem fjord, at the mouth of the little Nid River, and 250 miles N. of Oslo by rail. It is built on undulating slopes, and has regular and broad streets, the houses being mostly of wood, though the building of new wooden houses is now forbidden by law. The (fortified) harbour is capacious, deep, and safe, but is difficult of entry. The most interesting building in the city is the venerable cathedral, a cruciform church dating partly from the 13th century, of English-Norman architecture, and unquestionably the most interesting ecclesiastical edifice in Norway. A great fire in 1530 destroyed most of the church except the richly adorned octagonal choir (late Gothic). The church, since 1818 the place of coronation of Norwegian kings, has been carefully restored since 1880. Portions of an old archiepiscopal palace (Kongsgaard) also survive. The town is the main emporium of a wide district of country, and has a large trade by sea and land; the exports include copper ore, herrings and other fish, train-oil, timber, &c. The ancient capital of Norway, originally called Nidaros, Trondhjem was founded in 996 by Olaf Trygvason, and became in 1152 the seat of an archbishop. Its decline dates from the Reformation. It was taken by the Swedes after a siege of nine weeks, and has often been nearly destroyed by fire. Pop. (1920) 55,030.

Troodos, a mountain of Cyprus (q.v.).

Troon, a seaport and holiday centre, one of Ayr burghs, 6 miles N. by W. of Ayr and 33 SW. of Glasgow. The harbour, begun in 1808, is now owned by the L. M. & S. Railway Company. A fine parish church was opened in 1893. Troon has shipyards, several golf-courses, splendid sands, and good sea-bathing. Pop. 10,000.

Troop, in Cavalry, is the fourth part of a squadron, of which there are three in a British cavalry regiment. Each troop has a lieutenant or second-lieutenant in command, and comprises at war strength thirty-eight mounted non-commissioned officers and men.

Troopial. See TROUPIAL.

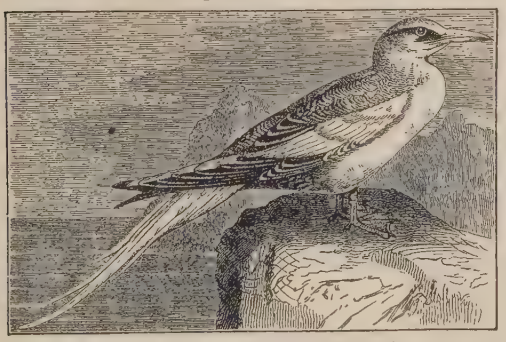
Tropæ'olum, a genus of plants forming the family Tropæolaceæ, by some united with Geraniaceæ. The species are mostly natives of South America, but several are found in Central America, and *C. crenatum* is endemic in Mexico. They are annual or perennial herbs of trailing or climbing habit, the leaves often peltately divided into several leaflets. The genus comprises the Great Indian Cress, misnamed Nasturtium (q.v.), *T. majus*, and the Small Indian Cress (*T. minus*), which are familiar in nearly every garden, along with the Canary-bird Flower or Canary Creeper (*T. aduncum*, or *peregrinum*), and many brilliant perennial species not so generally cultivated in Britain. The best known of the perennials is the Flame-flowered Nasturtium (*T. speciosum*), which, introduced from its native country, Chile, in 1846, is now one of the most frequent and brilliant ornaments of cottage walls throughout Scotland, particularly in the highland or northern districts, and also in North Wales. It is the envy of southern tourists, who carry roots of the plant home with them in the hope of establishing it in their own gardens, but rarely succeed. It requires peculiar atmospheric conditions to induce it to grow and flower freely; moderate exposure to light, such as would be afforded by a west aspect, high atmospheric humidity and cool nights, with deep moist but well-drained soil, are essential to its healthy growth. It is easily propagated by its creeping and underground rhizomes. There are several other hardy and greenhouse perennials with tuberous roots in cultivation, all of a very ornamental character. The tubers of *T. tuberosum*, a native of Peru, are edible.

Canary Creeper (*Tropæolum peregrinum*).

Trophonius, in Greek legend, was the most skilful architect of his day, and was the son of Erginus, king of Orchomenus, or of Apollo. Along with his brother, Agamedes, he built the temple of Delphi and the treasury of King Hyrieus in Bœotia, which the two are said afterwards to have plundered. After his death he was worshipped as a hero, and had a celebrated oracle at Lebadeia (Livadia) in Bœotia. The votary who wished to enter the 'Cave of Trophonius,' in order to consult the oracle, after preparing himself for several days by purification and sacrifice, lay on his back, put his feet into the cave, and was violently pulled inside by some unseen force. Don Quixote once thought himself to have got there.

Trophy was a memorial of victory erected on the spot where the enemy had turned to flight. Among the Greeks (except the Macedonians, who erected none) one or two shields and helmets of the routed enemy, placed upon the trunk of a tree, served as the sign of victory. After a sea-fight the trophy consisted of the beaks and stern-ornaments of the captured vessels, set up on the nearest coast. It was considered wrong to destroy such a trophy, and equally wrong to repair it. In early times the Romans decorated the buildings at Rome with the spoils of the vanquished. Of this practice we have a familiar instance in the *rostra* or beaks set up in the forum. In later times pillars and triumphal arches (see ARCH) were employed.

Tropic-birds (*Phaëthon*), a genus of intertropical pelagic birds, in a family by themselves. The bill is strong, pointed, serrated along the edges; the four toes are webbed; the tail is short save two greatly elongated median feathers. The legs are very short; the gait on land is shuffling; rising from level ground seems difficult. The flight is swift, with very rapid beats of the wings. The birds hover about ships or light on the rigging; they soar in circles, and plunge into the water from a great height. Sailors call them 'Boatswains.' They feed on fishes, cuttlefishes, and other open-sea animals. No nest is made, but a single egg, reddish-brown or buff with reddish-brown spots, is laid in a hole among rocks, occasionally in a tree,



Tropic-bird (*Phaëthon æthereus*).

and both parents incubate. The Common Tropic-bird (*P. æthereus*) is about the size of a partridge, white, with curved lines of black on the back; some of the quill-feathers black, tipped with white. It is found in the Atlantic Ocean. In the Indian and Pacific Oceans another species, the Red-tailed Tropic-bird (*P. rubricauda* or *phœnicurus*), appears, which is larger in size, of a deep roseate tinge, with red bill and the rectrices and long feathers of the tail red. The Yellow-billed Tropic-bird (*P. flavirostris* or *candidus*) is the smallest in size; it breeds in Bermuda, and occurs numerously in the South Atlantic, the Indian, and a great part of the Pacific Ocean.

Tropics (Gr. *tropē*, 'turning') are two parallels of latitude on the terrestrial globe, passing through the most northerly and southerly points on the earth's surface at which the sun can be vertically overhead at noon. The tropics include between them all points on the earth's surface at which the sun is ever vertical. The tropic north of the equator is called the Tropic of Cancer, because the sun at the summer solstice (when he is vertically over that tropic) enters the sign (not now the constellation) of Cancer; and the southern one is, for a similar reason, called the Tropic of Capricorn. Though usually said to be in 23½° N. and S. lat., the tropics are not fixed at a uniform distance from the equator, but the limits of their variation are extremely narrow.

Tropidonotus, a large cosmopolitan genus of snakes, including the grass snake. See SNAKES.

Tropism. See PLANTS (*Movements*).

Troppau (Czech *Opava*), a town of Czechoslovakia, till 1918–19 capital of Austrian Silesia, on the Oppa, a tributary of the Oder, 137 miles NE. of Vienna. It has an old town-hall, a library, and manufactures of cloth, beet-sugar, &c. Pop. (1920) 33,457.

Trossachs, a wooded defile of Perthshire, 8 miles W. by S. of Callander, which Scott's *Lady of the Lake* has made one of the places of pilgrimage of the world. It extends 1 mile eastward between Lochs Katrine and Achray, and to the north has Ben A'an (1851 feet), to the south-west Benvenue (2393 feet).

Trotskoye, new name of Gatchina (q.v.).

Trotsky, LEO DAVIDOVICH, Russian revolutionary, reputed to be a Jew originally called Bronstein or Braunstein, born in 1877 near Elisavetgrad, was sent to Siberia in 1901, took part in the 1905 revolution, was again sent to Siberia, escaped, and lived as a journalist in many countries. At first a Menshevik, he became a Bolshevik, and the Bolshevik revolution of 1917 made him People's Commissary for foreign affairs. Obliged to accept the treaty of Brest-Litovsk, he exchanged his post for that of war and marine, and wielded the force of Bolshevism (defensive and aggressive) against Russian 'Whites' (Koltchak, Denikin, &c.), and against Poland and other neighbours. Dissentions arose after Lenin's death, and in 1925 Trotsky was deprived of his commissaryship. While still retaining minor offices in the party organisation he attacked the other leaders. He wrote *A History of the Russian Revolution* (trans. 1919), and other works. See RUSSIA; and Max Eastman, *Trotsky* (1926).

Trotternish, the northern peninsular district of Skye (q.v.).

Trotting, a favourite American sport with a distinctive type of horse. Since early in the 19th century the trotting strains have been much improved by careful breeding, while skilful training has aided in their development. Indeed, it may be said that the trotter is the national horse of America, where it is considered the ideal animal for both business and pleasure. There are trotting strains elsewhere than in America—for instance, the Norfolk trotters in England and the Orloff trotters in Russia—but no other strain has attained the speed of the trotting-horse in America. The turf test of speed is the only one by which trotting strains can be judged, and trotting races are held in America for the purpose of applying this test, quite as much as to furnish sport to spectators. Compared with running races, even in America, trotting contests are not very popular. The trot and the amble or pace are kindred gaits, the latter being the faster. The trot is a diagonal and the

pace a lateral gait. In the trot the order of movement is left fore-foot, right hind-foot, right fore-foot, left hind-foot. Thus the left fore-foot and right hind-foot move in unison, striking the ground together; then in turn the right fore and left hind foot complete the movement. In the pace two feet are also moved simultaneously, but the two feet moved at once are on the same side. From the same strains of blood there frequently come both natural trotters and pacers. Though pacing is the faster gait, it is not considered desirable, and pacers are often converted into trotters by the use of heavy toe weights on the forward feet. A competent trainer by the use of these weights can change an inveterate pacer into a trotter. As the horse becomes used to the trot the weights are gradually reduced. The gait of even natural trotters is oftener than not helped by the use of toe weights.

The best strains of American trotters trace back to the thoroughbred gray stallion Messenger, imported from England in 1788 when he was eight years old. He was by Mambrino, first dam by Turk, second dam by Regulus, third dam by Starling, fourth dam by Fox, fifth dam by Bay Bolton, sixth dam by Duke of Newcastle's Turk, seventh dam by Byerly Turk, eighth dam by Taffolet Barb, and ninth dam by Place's White Turk. Though this record shows that Messenger's pedigree goes back to the very beginning of the thoroughbreds, it is generally thought that he himself was not, strictly speaking, a thoroughbred. The more frequent the Messenger cross is found in the pedigree of a trotter, the more valuable the strain is thought to be. Messenger begot Mambrino, Mambrino begot Abdallah, and Abdallah begot Rysdyk's Hambletonian. Rysdyk's Hambletonian, foaled in 1849, was out of the Charles Kent mare by Bellfounder, a horse imported from England, and said to come of the strain of Norfolk trotters, and with two crosses on the dam's side tracing back to Messenger. Rysdyk's Hambletonian is considered by breeders to be the father of the American trotters.

The breeding of trotters has become in the United States and Canada a great industry.

The first trotting-race in America of which there is a record was at Harlem, N.Y., in 1806, when Yankee did a mile in 2 minutes 50 seconds. In Philadelphia in 1810 a Boston horse trotted a mile in 2 minutes 48½ seconds. The next race was in 1818, when the time was 3 minutes. There was nothing very wonderful about these performances, for horses in England had before then done as well, if not better. The time has since been gradually reduced. Peter Manning, in 1922, did a mile in 1 minute 56¾ seconds at Lexington, Ky. With a running mate, Uhlan trotted a mile in 1 minute 54½ seconds in 1913. Long-distance trials are justly regarded as cruel and unprofitable.

Among pacers the best records are those of Star Pointer, which paced a mile, in 1897, in 1 minute 59¼ seconds, and Dan Patch, which did the same distance, at St Paul, Minnesota, in 1906, in 1 minute 55 seconds.

Trotzendorf. See FRIEDLAND (VALENTIN).

Troubadours. See PROVENÇAL.

Trough, PNEUMATIC, is a piece of chemical apparatus devised by Priestley, by means of which gases can be collected in vessels. It consists of a vessel of water, provided with a ledge or shelf at the depth of two or three inches from the top. The jars in which the gas is to be collected are filled with water, and placed with their mouths downward upon the shelf, which is kept a little under water, so as to prevent the entrance of air into the jars. When the edge of the jar is brought over the extremity of the tube carrying the gas, the bubbles of gas rise, collect in the upper part of the jar, and displace the liquid. Other suitable liquids may be used.

Trough-shell. See MACTRA.

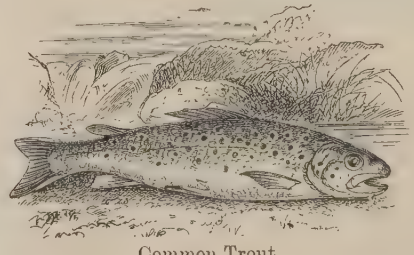
Troupial (*Icterus icterus*), a bird of the family of Hang-nests (q.v.), famous for its song, which rivals that of the Baltimore oriole. Members of the allied genus Trupialis are also called Troupials.

Trousers. See BREECHES.

Trout (*Salmo fario*). This familiar fish of our streams is widely distributed throughout Europe, and has proved itself a robust species when transported to distant lands. Living and thriving as it can under widely different conditions of life, the fish naturally assumes different appearances. So much is this the case that in systematic natural history the trout has been treated in different ways. Some naturalists have described a great many separate species of trout; others have concluded there is but one species, which is represented by many varieties or local races. The latter view was first expressed by Widegren in 1863, and it is the view to which later zoologists have returned after a period of over-differentiation which is well exemplified in Günther's *Catalogue of the Fishes of the British Museum in 1866* (vol. vi.). In the classification of the Salmonidæ now accepted, the char is separated from the trout, and the sparling or smelt is excluded altogether.

The question comes to be whether or not the distinctions noted are sufficient to justify a separation into species. With regard to this it may be said that the more all kinds of trout are studied, the more clearly does it appear that the so-called separate species blend in the most perplexing manner, so that very many examples cannot be definitely assigned to this or that species, and that all of them can interbreed most freely, and also that when trout are moved from one locality to another they rather readily undergo change of appearance. A good example of this was obtained after typical small brook trout from Dorsetshire were introduced into certain New Zealand rivers. In their new surroundings they grew rapidly, took on a silvery appearance, and migrated to the sea. In a few years they were indistinguishable from pure sea-trout, and as a matter of fact, after careful examination of specimens sent to the British Museum, they were diagnosed as *Salmo trutta*. If, therefore, *Salmo fario* is to be regarded as a separate species from *Salmo trutta*, this was the evolution of a species in a remarkably short time. The more rational view is to regard all the trout as belonging to one plastic species.

Nevertheless, the sea-trout is such a well-defined fish, with such distinctive habits, that it is certainly convenient to regard it separately from the fresh-water trout. It is variously called Sea-trout,



Common Trout.

Salmon-trout, or White Trout, and the reader will find it described in the article Salmon. For the Bull Trout, see under that head.

There remain, even in Britain, quite a number

of local races of trout which have formerly been classified as distinct species, and two or three of these approach very nearly to the sea-trout.

The typical *Salmo fario* is a well-proportioned fish, yet is not so fine in the lines as the salmon. The head is larger in proportion to the body, the eye is also larger, the gape, especially in young examples, considerably wider, the strong maxillary bone reaching to a point vertically below the back of the eye. The vomer bone, which runs along the roof of the mouth, carries a double row of teeth, which persist throughout life. The hind-part of the body is stout, and the scales, if the row be counted from the back of the adipose fin downwards and forwards to the lateral line, are usually fourteen to sixteen in number. The colour is brown on the back and yellow on the belly. The spots and markings on the body are subject to great variation, but red spots usually occur, and the young examples have the 'parr markings' common to young salmonidæ generally; dark-brown spots are also common. Every trout-angler knows how widely different trout from different localities may look when caught—the fish from the clear-water river, with its bright colouring and sharply contrasted markings; the fish from the peaty mountain tarn, with its dingy brown back and dirty-white belly. Even from different parts of the same hill loch, trout may be yellow, with red speckling, and as silvery as new shillings. This is so, for instance, in a small loch at a high elevation in the island of Raasay. Superficial differences such as these are due to varied bottom and to feeding. All intermediate conditions can also be obtained. In certain lochs, however, it seems likely that a silvery tendency in some of the trout is due to the importation of sea-trout fry.

Salmo fario can migrate to brackish water without inconvenience, and several cases are on record of examples being caught at sea. It frequents estuaries of rivers much more than most people suppose. Such fish grow rapidly on a diet of herring and other marine forms. An approximation to the appearance of sea-trout naturally results, and in this way have been described the Orkney Trout, *Salmo orcadensis* (Günther); the Estuary Trout or Slob Trout, *S. estuarius* (Knox), *S. gallivensis* (Günther). Then a form with blackish fins found in streams of Cornwall and Wales has been described as closely allied to the Orkney trout. It is called the Cornish Trout, *S. cornubiensis* (Walb) or *S. nigripinnis* (Günther). This, again, brings us to affinities with the famous *S. ferox* or Great Lake Trout, a variety which Highland gillies delight to describe as a separate species, but which is merely a large and old trout of cannibal habit which has gone to large and usually deep lakes for its food. Its dentition is usually formidable, and it fights the angler with great vigour. In colour it is usually very dark, owing, no doubt, to its adopted habitat. Specimens of 10 lb. to 15 lb. are not uncommon, and fish up to 32 lb. are on record in Ireland. Examples of the Orkney trout have on occasion run these weights close, the record Loch Stennis trout being a fine fish of 29½ lb. Another variety which must be mentioned is the Gillaroo Trout, found principally in Loughs Corrib, Mask, Derg, and Melvin in Ireland, and in the river Shannon. It usually frequents a rocky bottom, and feeds very largely on several kinds of water-snails, from which habit it apparently develops a greatly thickened muscular stomach. Hence the specific name given to it by Günther is *S. stomachicus*. In some of the Sutherlandshire lochs a variety of trout called a Gillaroo is also found, but in it the deep shape and muscular stomach of the typical Irish fish are not so noticeable. As showing that this thickened muscular stomach cannot properly have specific value, it may be noted that if Gillaroos are transported to localities where they do not find their familiar molluscan food, the gizzard-like stomach disappears. With regard to *S. ferox*, it may be added that Dr Günther, in giving specific distinction, laid great stress on the preoperculum being crescent-shaped, the hinder and lower 'limbs' passing into each other without forming an angle. This feature is, however, by no means uncommon amongst ordinary brown trout. Other differences stated were in the number of the vertebræ and pyloric appendages—the latter a feature notoriously subject to great variation—while the common brown trout and the Gillaroo trout have both been shown to exhibit the number of vertebræ attributed to *S. ferox*. Further, it is remarkable that no one has ever described a young example of *S. ferox*. The reason undoubtedly is that young trout never show the characteristics of the *ferox*. To appreciate the haggard ugliness of this old lake-living trout, it is necessary to see him at the spawning season. The largest examples are no doubt past spawning, but those which do ascend streams for this purpose are so specially hag-like that one almost hesitates to handle them. They are probably quite as bad as pike for devouring young fish. Just as the land-locked salmon of Sweden and America make their feeding-places the large lakes of these countries, so our *ferox* establish themselves in our large and deep lochs. Large and old trout which have not the same access to these extensive feeding-places make their way to the sea.

A most beautiful variety of trout is found in Loch Croisaphuill, in Sutherland. This loch has very clear water covering a bottom of sand and light-coloured gravel. The fish are very shapely, and of a bright, silvery colour. Many other lochs, however, produce trout of great beauty.

The most famous trout of all is perhaps the Lochleven trout, which has received the specific name *S. levenensis*. It is a handsome fish, often very silvery, with numerous dark markings. The flesh is red, and the flavour of the fish is considered excellent. The feeding in the loch is rich, and consists not only of flies, but great numbers of blood-worm larvæ, fresh-water shrimps, and water-snails. No variety of trout is more extensively used for stocking purposes than the Lochleven. Like other trout, however, it is subject to considerable modification when transferred to other localities, and if the food of another locality is less rich, the fish sooner or later shows approximation to the appearance of the native trout. This is most marked where stocking is carried to excess, which is another way of saying that good development of trout in any water is in direct relation to the quantity of food present, and that the condition of trout and the size of trout may often be improved by reducing their number. At the same time, Lochlevens form excellent stock in most waters, and are greatly to be preferred to certain foreign varieties, notably Rainbow Trout, which is a native of California, but which seems to possess characteristics which render it unsuited for British lakes. The common experience after stocking with Rainbow fry is that in about two years the fish have unaccountably disappeared. Perhaps the best success which has attended the stocking with this fish has been in the river Tamar, in Devonshire, where the Rainbows are reported to have become well established. British trout have been acclimatised in the southern Australian states and New Zealand; the Californian Rainbow Trout also flourishes in these waters, and has a range extending into Queensland.

Trout generally spawn rather earlier than salmon, and their habit in spawning is similar. Those in

lakes ascend or descend streams connected with the lakes, but also to some extent spawn in the gravel at the margins. The Gillaroo trout are reported to spawn chiefly in the latter way.

To distinguish between a salmon parr or smolt and a trout is a matter of considerable importance in view of the law prohibiting the taking of the former. The so-called parr-marks or finger-marks on the young salmon are by no means peculiar to parr, but are more or less obvious on all young salmonidæ in Britain; indeed, the trout of certain localities seem to preserve these markings through life.

Two features which distinguish the salmon parr most clearly are the smallness of the gape and the slenderness of the caudal peduncle or 'small of the tail.' Other features are also present, but are less obvious to the angler, who has probably a single specimen to deal with at the river-side. The first may be defined most clearly by noticing the bone at the side and above the mouth—the maxillary bone. If the fish be held horizontally with the mouth shut, the angular termination of this bone will be, in the case of the salmon parr, directly below the centre of the eye. In the case of the trout it will be directly below the posterior edge of the eye. In the case of adult salmon this test does not apply. With regard to the other feature—the small of the tail—the test is difficult to apply to small fish, but is applicable throughout the life of both species. If the scales be counted in the row running downwards and forwards from the back of the adipose fin to the lateral line, it will be found that the salmon has eleven and sometimes twelve, while the trout has thirteen to sixteen.

A trout the size of a salmon parr may be a fairly old fish, in which case the tail will not be forked. In coloration the parr and the trout may be very much alike.

In the case of the smolts of sea-trout there is a bright silvery sheen similar to that seen in the salmon smolt, and the sea-trout smolt is very commonly rather larger than the salmon smolt. The fins are, however, a distinct yellow colour, and the adipose is usually tipped with bright orange colour. Hence these fishes are commonly called yellow fins. In the salmon parr the fins are dusky or dark, the ventral excepted, and the tail fin is always much forked.

With regard to the weight to which trout may attain in our islands, the record seems to have been made in Ireland, where a fish of 36 lb. was caught in Lough Corrib some years ago. The specimen is preserved in the Dublin Museum, and for a considerable time was regarded as a salmon. About the year 1880 or 1882 a trout of 49 lb. was reported as having been taken, but no trace of it seems to have been kept. Another Irish weight, which is still exceptional, and which in this case is certainly authentic, is a trout of 28½ lb. In Scotland a 35-lb. trout is reported to have been caught in the Pass of Brander by Mr Muir of Innishtynich. Dr Almond of Loretto caught a 27½-lb. trout in Assynt; and another 27½-lb. trout was taken in the river Tay—a record amongst river-caught trout. The heavy trout of modern times seem to compare very unfavourably with these monsters.

In Scotland there is a close time for trout from and including 15th October to 28th February. In England no trout may be sold between 2d October and 1st February. In Ireland the close time for trout varies in different localities, and harmonises with the close time for salmon. The closing dates are contained in the period between 31st July and 2d November, the opening dates between 31st January and 30th April.

See works named at ANGLING and in Westwood and Satchell's *Bibliotheca Piscatoria* (1883; with supplement by R. B. Marston, 1901); Livingstone Stone, *Domesticated Trout* (1877); the Marquis of Granby and others, *The Trout* (1898); C. Tate Regan, *British Fresh-water Fishes* (1911).

Trouvère, the name given in northern France to the same kind of courtly or polished poet who in southern France, &c., was called Troubadour (see PROVENÇAL). Like the latter, he was usually attended by a jongleur, whose business it was to accompany the songs which his master composed and sang. But the distinction was far from absolute. See CHANSONS DE GESTE, JONGLEURS, FRANCE (*Literature*), ROLAND.

Trouville, a popular French watering-place, in the dept. of Calvados, on the E. bank of the river Touques, at its mouth, about 10 miles SW. of Honfleur. It was always famous for oysters, but on its fine sands and its nearness to Paris depends its modern importance. It was first brought to notice by Alexandre Dumas. Pop. 6000.—DEAUVILLE, opposite to Trouville, has risen to great repute as a fashionable summer resort for golfing, horse-racing, &c.; pop. 4000.

Trover, in the law of England, is an action brought to recover goods from a person to whom they do not belong, but who has in some way obtained possession of them. It was founded on the old fiction that the rightful owner had accidentally lost the goods, and the party in possession had found them, and would not give them up to such owner. It is practically an action to try the title to the goods, and therefore is of extensive application in the law of contracts, as well as other branches of law. The plaintiff, if successful, recovers the value of the goods as a satisfaction. The defendant is said to have illegally converted or appropriated the goods; it is by the conversion of the goods that the damage is done, and for this the remedy is given. See Bullen and Leake, *Precedents of Pleadings.*

Trowbridge, a market-town of Wiltshire, on a rocky hill above the small river Biss, 12½ miles by rail SE. of Bath and 12 SSW. of Chippenham. A Norman castle at Court Hill has vanished. The fine Perpendicular church of St James (1475) has a spire 159 feet high; Crabbe the poet was rector from 1814 to 1832, and is buried in the chancel. A new town-hall, presented by W. R. Brown, was opened in 1889; and there are also a market-house, public gardens (1884), cottage hospital (1886), water-works (1873), &c. Trowbridge has been a seat of the woollen manufacture since Henry VIII.'s reign; and superfine broadcloth and kerseymere are largely manufactured. Pop. 12,000.

Troy. 'The tale of Troy divine,' which forms the background of the *Iliad* of Homer, briefly told is that Paris (Alexander), son of Priam, king of Troy, carried off Helen, wife of Menelaus, king of Sparta; that the Achæan princes, under the command of Menelaus's brother, Agamemnon, king of Mycenæ, undertook to recover Helen; that the Achæans, having besieged Troy for nine years, eventually sacked the city and brought Helen home. These events were regarded as historical not only by the Greeks themselves, but by the moderns within quite recent times, and a date (1184 B.C.) was assigned with as much precision and confidence to the fall of Troy as to the fall of man. But the remarkable revolution in the views of scholars about mythology, which was begun by Lobeck (see MYTHOLOGY) in 1829, and by the brothers Grimm (q.v.), changed all that. Many of the incidents in the Trojan war were shown to be myths common to most Indo-European nations at least. The story of the *Iliad* reduced itself to 'the old fight between the night and the morning, the old story of the victory and death of the solar hero around the walls and

battlements of the sky.' And as late as 1875 it was finally said that 'to seek for fragments of history in either of these is like looking for gold in the rays of the sun' (Sayce, *Principles of Comparative Philology*, p. 311, note). The Troy and Mycenæ of Homer were regarded as the airy fabric of a poet's dream, when Dr Schliemann, who had begun his excavations in 1870, brought to light actual stone walls and battlements on the traditional site of Troy, and then proceeded to Mycenæ, where 'he dug up such masses of gold as even he, the millionaire, had perhaps never before seen upon one spot.' Guided by his simple faith that what Homer said was true, he continued his excavations until he had demonstrated, by 'the science of the spade,' 'the former power and splendour of every city which is mentioned in Homer as conspicuous for its wealth and sovereignty.' It was natural enough that in the first joy of discovery he should straightway call the palace he revealed at Troy 'Priam's Palace,' the entrance to the citadel 'the Scæan Gate,' and the golden relics 'Priam's Treasure.' The treasure consists of big diadems of gold, chains and pendants of gold, golden ear-rings, all packed in a silver jar, bars of silver, 8700 small gold rings, disks, buttons, and small bars of gold, silver vases, gold cups, electrum cups, silver daggers, &c. The whole of this treasure had been packed together and stowed away probably in a secret chamber constructed in the acropolis wall. It was also natural that these identifications (subsequently withdrawn by Schliemann himself) should be disputed. The question was set at rest by Dörpfeld, who continued the work after Schliemann's death. Schliemann had dug down through the remains of Homer's Troy (which he almost overlooked) to those of an earlier city. Naturally the culture of which he found evidence could not easily be made to square with the traditions that had come down to Homer, or with Schliemann's own finds at Mycenæ. The very site of Troy had been matter of dispute for 2000 years: tradition pointed unswervingly to the mound of Hissarlik; the learned unanimously (with the exception of Grote, who was in the right) declared that Hissarlik could not be the site. Schliemann and Dörpfeld excavated Hissarlik, and showed that it had been the site of nine successive settlements. On the top are the remains of (9) the Græco-Roman memorial town, Novum Ilion; below it the scanty ruins of (8) the Hellenistic Ilion, destroyed by Fimbria, a notable place of pilgrimage for its temple of Athena, and of (7) a village of classical Greek times, with objects of Danubian type. Then comes (6) Priam's city. Below it are (5, 4, 3) three small villages, (2) 'the burnt city,' and finally (1) the oldest city. These so-called cities are rather castles or fortified villages. The first city yielded principally pottery and stone implements. Metals were practically unknown to its inhabitants, who were plainly a settled pastoral and agricultural people, familiar with the art of weaving. Their hand-made open-fire pottery is decorated in straight lines and zigzags filled in with white chalk. The settlement had thin walls of small rough stones and clay. The date may be somewhere about the first half of the third millennium, B.C. The interval between its desertion and decay and the foundation of the next city must have been long, for a layer of earth 1 foot 9 inches deep intervenes between the débris of the first and the second or 'burnt city.' This city had rude Cyclopean walls, and a palace of 'North-Greek' type with a megaron. It enjoyed a long period of prosperity, for it outgrew its original walls, which to begin with enclosed a larger area than that of the first city. Not only the walls but the dwelling-houses were rebuilt more than once. The inhabitants were, however, still in the early Bronze Age. The potter's wheel and the kiln were now regularly used. This, the city of Schliemann's great finds, was destroyed by fire. It is now recognised as approximately contemporary with the Third Early Minoan period in Crete (say 2500–2000 B.C.). The fifth city, with beginnings of Mycenæan culture, may be that destroyed by Hercules (q.v.). The sixth is much greater in extent. It had a wall of massive ashlar masonry with great towers, stone houses, and 'Mycenæan' pottery. It exhibits, in fact (with a difference), the culture of the Third Late Minoan age of Crete. Its date is the end of the Bronze Age, say 1500 or 1200 B.C. Now once more it is possible to believe that the story of Troy has a basis in history. The cause of its siege has been sought in the fact that it commanded the Hellespont trade-route, while the decay of the Hittite empire, with which Troy may have been allied, probably gave encouragement to the expanding Achæans.

See the articles CRETE, HOMER, MYCENÆ, SCHLIEMANN, VIRGIL; books by Schliemann, Dörpfeld, Schuchhardt, and Leaf.

THE LEGEND OF TROY.—The legend of descent from the exiled Trojans, so long a favourite notion of the Romans themselves, early took firm hold of the popular imagination in France and England, but it was not Virgil and Statius so much as the spurious histories of Dares the Phrygian and Dictys of Crete (q.v.) that supplied the threads from which was spun the mediæval tale of Troy divine. As early as the 2d century Philostratus (q.v.) in his dialogue the *Heroica* began the artistic elaboration of the theme, and we find traces of it in the Arthurian legends, the Fabliaux, and the like; another Greek work is the *Iliaka*, in hexameters, by Joannes Tzetzes, the 12th-century Byzantine grammarian; two Latin elegiac poems of the 12th century are extant, the first anonymous, the other by Simon Chèvre d'Or, canon of the abbey of St Victor in Paris; but it was *c.* 1160 that it took its final literary form in the *Roman de Troie* of Benoît de Sainte-More, a poem of about 30,000 lines, dedicated to the English queen Eleanor of Poitiers. The characters and incidents are transformed by the artist's touch, taking the colour of his own time, while entire episodes are freely invented—of which the finest, devoted to the loves of the faithless Briseïda, daughter of Calchas, first with Troïlus, next with Diomede, furnished to Boccaccio the subject of his poem *Filostrato*, on the loves of Troilus and Griseida. Of the *Filostrato* Chaucer's 'litill tragedie' *Troilus and Cryseyde* was a free and largely expanded translation, although he speaks of himself as a translator out of Latin, and in two places quotes his author by the name of Lollius. Gower in his *Confessio Amantis* follows Chaucer, enumerating Troilus and Cressida among his illustrious lovers; and Henryson wrote a sequel. Benoît's work was much imitated; it was translated into German in the 12th century, and into Latin at Messina in the 13th by Guido delle Colonne, who did not name his source, and long passed as the author. This work had a wide popularity in English, Italian, French, and German translations. It was the origin of several English versions, including the alliterative *Geste Hystoriale of the Destruction of Troy*, the *Troy Book* attributed by its scribe to Barbour, and Lydgate's *Troy Book* (1412–50; printed by Pynson, 1513). Caxton's *Recuyell of the Historyes of Troye* (*c.* 1474), the first book printed in English, was a translation of Raoul Le Fevre's French version. The *Life and Death of Hector* was a modernisation of Lydgate by Thomas Heywood (1614). From Henslowe's Diary we find that Dekker and Chettle in 1559 prepared a *Troilus and Cressida*; Shakespeare (1609) followed Chaucer for the story, and Lydgate for

some of the details. The Troy legend kept its place throughout the middle ages in graver histories as well as in romances and mysteries, and it long continued to maintain a shadowy existence in chap-books. Brut, the eponymous Trojan hero who found his way to Britain, flourished in Geoffrey of Monmouth, Gaimar, Wace, Layamon, and long after these in English chronicles whether in verse or prose, and indeed in the 16th century Polydore Virgil was thought a fool and worse for doubting him.

See the introduction of Moland and D'Héricault to *Nouvelles Françaises en Prose du XIV^e Siècle* (1858); Joly, *Benoît de Sainte-More et le Roman de Troie* (1870); W. Greif, *Die mittelalterlichen Bearbeitungen der Trojanersage* (Marb. 1886); Collilieux, *Dictys et Dares* (Gren. 1886); the admirable introduction to E. Gorra, *Testi inediti di storia Trojana* (Turin, 1887); Gordon, 'The Trojans in Britain' in *Essays and Studies*, vol. ix. (English Association); Mülder, *Die Ilias* (1910). For the relation of Chaucer's to Boccaccio's poem, see W. M. Rossetti in Chaucer Society's publications for 1875.

Troy, capital of Rensselaer county, New York, on the east bank of the Hudson River, at the head of steamboat navigation, and 5 miles by rail above Albany, is built upon an alluvial plain 3 miles long and on the hills to the east (the southernmost known as Mount Ida). The most noticeable buildings are the marble court-house, the Troy Savings Bank building, including a fine music-hall, and several of the fifty churches. The city contains a high school, the Rensselaer polytechnic, and a Roman Catholic seminary. Iron and steel, cotton goods, shirts and collars, mathematical instruments, stoves, nails, machinery, horseshoes, &c., are manufactured. Steamers run to New York. Two bridges cross the Hudson to Watervliet (q.v.; formerly called West Troy). Troy was settled by the Dutch in 1659, and incorporated in 1816. Pop. (1850) 28,785; (1910) 76,813; (1920) 72,013.

Troyes, a town of France, the capital formerly of the province of Champagne and now of the department of Aube, on the left bank of the river Seine, 104 miles ESE. of Paris by rail. In spite of modernisations it is still an old-fashioned place, with many quaint timbered houses. The cathedral, a splendid specimen of Flamboyant Gothic (begun in 1208, and consecrated in 1429 in the presence of Jeanne d'Arc), with some beautiful stained glass, and the church of St Urbain (13th century), also with good stained glass, are especially noteworthy; other churches include those of Ste. Madeleine, St Jean-au-Marché, St Pantaléon (decorated with sculptures), and St Nicolas. The museum has a collection of sculptures of the Champagne school. Troyes carries on cotton, linen, and woollen manufactures, and, as the centre of a rich agricultural region, has a large transit trade. Pop. (1872) 38,113; (1921) 55,215. The capital of the Celtic Tricassii, Troyes was called by the Romans *Augustobona*, later *Civitas Tricassium*, and then *Trecæ*, whence the modern name. Under the Counts of Champagne (9th to 14th century) it rose to great importance, and its fairs standardised Troy-weight (q.v.); so late as the close of the 16th century Troyes had upwards of 60,000 inhabitants. Here the treaty was concluded (1420) between Henry V. of England and Charles VI. of France, and here arose a famous school of sculpture in the 16th century. See Boutiot's *Histoire de Troyes* (5 vols. 1870–80).

Troyon, CONSTANT (1810–65), French landscape painter, was born at Sèvres. See the monograph on him by Dumesnil (1888).

Troy-weight seems to have taken its name from a weight used at the fair of *Troyes*, an important centre of commerce during the middle ages. Like Cologne, Toulouse, and other towns, Troyes may have had its own special system of weights. A Troy pound (of what value is unknown) is first mentioned in Britain in 1414, long before which period the standard pound of 12 oz. as well as another pound of 12 oz. (the Tower pound) was in use. The term 'Troy' was first applied to the standard pound in 1495, but at the same time no change seems to have been made in its value, and it continued, as before, to be exclusively employed by the dealers in the precious metals, gems, and drugs. See POUND. The troy pound contains 12 oz., each ounce 20 pennyweights, and each pennyweight 24 grains; thus the pound contains 5760 grains, and is to the avoird. pound as 144 to 175; while the troy ounce is to the avoird. ounce as 192 to 175. (The apothecaries' oz. and lb. are now practically obsolete; drugs are bought and sold by avoirdupois, though compounded by apothecaries' weight.) The old English pound, to which the term Troy was afterwards applied, was doubtless the pound of silver; and the Tower pound of 12 oz. differed from it only by $\frac{2}{3}$ths of an ounce.

Trozkoye, a new name for Gatchina (q.v.).

Truce, a suspension of hostilities between two armies or states for a period specially agreed upon. During a truce it is dishonourable to occupy more advanced ground, or to resort to any act which would confer advantage. A truce requires ordinarily to be confirmed by the commander-in-chief to become binding. It is lawful to break it before the prescribed period on notice previously agreed on being given to the opposite party. This is called denouncing a truce. For the 'truce of God,' see GOD'S TRUCE.

Truck-system (English *truck*, Scots *trock*, French *troquer*, 'to barter') is the practice of paying workmen in goods instead of money. Where large undertakings are carried on at a distance from towns, it is almost necessary that employers should take steps to provide for a regular supply of provisions and other necessaries, to be sold to their men. This form of trading is open to objection on many grounds. The profit to the employer is very doubtful, for the capital which he devotes to his shop might probably be used to greater advantage in his proper business; the men are liable to be defrauded in various ways, because they cannot bargain on equal terms with their employer. A colliery owner, for example, may set up a shop, and may refuse to employ any man who does not deal at the shop. He may supply goods of inferior quality, and dismiss any man who is bold enough to complain. He may make the advances frequently required by the improvident wage-earner, intimating at the same time that he expects the money to be spent at his shop and no other; the account may be further complicated by vexatious deductions of pay for sharpening tools, &c.; and the workman may submit to all these exactions, because there is the threat of dismissal in the background. The evils of the truck-system are known in many countries; Canadian lumbermen, Newfoundland fishermen, and German Socialist leaders have had to protest at various times against it. In England the Truck Act of 1831 (extended by the amending act of 1887 to all persons engaged in manual labour, except domestic servants), and the Truck Act of 1896, were intended to provide a remedy. Wages are directed to be paid in current coin; the employer cannot plead payment in goods as an answer to an action for wages, nor can he maintain an action for the price of goods supplied. He may supply medicine, medical attendance, fuel and tools for mining, provender for beasts, house accommodation, and victuals prepared under his own roof. Deductions of pay are strictly regulated

by the Act of 1887. These statutory rules are sometimes evaded; men who require advances of pay are too much at the mercy of employers to take advantage of the acts. The evils of the system are graphically described in Disraeli's *Sybil*. In 1853 Mr J. H. Burton was employed by the government to investigate the working of the system in Scotland. His report seems to indicate the failure of legislation to reach the abuses complained of; attempts to suppress a long-standing practice may even strengthen its hold. Combination and improved habits of thrift among workmen put an end to the system by making them less dependent on their employers. Employers who evade the law usually allege that they cannot help themselves. The rate of wages, they say, is fixed on the assumption that part will come back in the shape of profit on goods; if they give up the shop, they must pay lower wages, and this the men will not stand. For the English law relating to this subject, see Macdonell, *Law of Master and Servant*. See also CROOK (GEORGE).

Truffle (*Tuber*), a genus of fungi of the order Tuberaceæ, division Ascomycetes; globose, or nearly so; of a fleshy substance, with a distinct skin, the whole substance pervaded by a network of serpentine veins, which are the *hymenium*, and bear the spore-cases in minute cavities. The species are not numerous; they are very generally diffused in temperate parts of the world; they are subterranean, often found at the depth of a foot or more in the soil, usually near the roots of trees, or rarely living on the surface. Some of them are amongst the most highly valued of esculent fungi. They are said to have a stimulating aphrodisiacal quality. The Common Truffle (*T. æstivum*) is of a black colour, and has a warty surface. It is the principal species sold in the English markets. It varies in size from that of a large plum to that of a large potato. On account of its agreeable flavour, it is used in the preparation of many dishes. It is common in the central and southern parts of Europe, chiefly in loose soils, in woods and pastures, as in the chestnut woods of France and Italy. In England it occurs pretty abundantly in the downs of Wiltshire, Hampshire, and Kent. Truffles probably occur in many districts, but owing to their subterranean growth are unsuspected. In England, and also on the Continent in localities in which they are known to grow, trained dogs are employed to discover their whereabouts, and in France and Italy pigs are employed for the same purpose. The true Périgord Truffle, which is considered superior to the English, is *T. brumale*, var. *melanosporum*. The White Truffle of Germany, which also is found in England, is *Chæromyces albus*, of a genus closely allied to Tuber, but less esteemed in cookery than the common truffle. The Red Truffle of the Bath Market is *Melanogaster*, a genus of the allied order Hypogæi, and is not therefore a true truffle. The African truffles, species of Terfezia and Tirmannia, somewhat inferior to it in quality, are in some parts of Algeria and Tunis an important food-supply for the people. In the south of France truffles are said to have been produced in woods which have been watered with water in which the parings of the truffle have been steeped. In Poitou the practice prevails of enclosing a space on the downs and sowing it with acorns. When the oaks are large enough to shade the ground, it is said there is sure to be a crop of truffles. Light chalk soil appears to be preferred by truffles, and they are found most usually in beech, oak, birch, chestnut, hazel and hornbeam woods.

Truffle (*Tuber æstivum*).

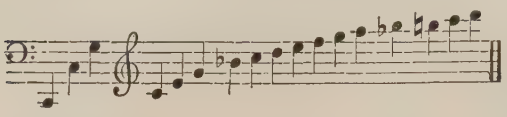
Trujillo, (1) a town of Spain (Lat. *Turgalium*), the birthplace of Pizarro, is in Cáceres province, 60 miles NE. of Badajoz. It manufactures linen, leather, and pottery. Pop. 11,000.—(2) An episcopal city of Peru, capital of the dept. of Libertad. It was founded in 1535 by Pizarro, who named it after his Spanish birthplace, has walls raised in 1686 to keep out the filibusters, and contains a college, a theological seminary, and high school. In 1882 it was sacked by the Chilean troops. There are large sugar plantations in the neighbourhood. Its ports are Huanchaco and Salaverry. Pop. 25,000.—(3) A town of Honduras, on the north coast, with 2000 inhabitants, and an export trade in sarsaparilla, bananas, hides, mahogany, rubber, and cattle. The town dates from 1524. Its new port, Puerto Castilla, is five miles off. A railway from Trujillo to Juticalpa is in the course of construction.

Trullan, the name (derived from the dome-roofed hall—Gr. *troullos*—of the palace in which the Fathers assembled) given to two church councils. The first Trullan Council (680) is the 6th œcumenical council, which condemned monophysitism. The second, called by Justinian in 692, established 102 canons for the discipline of the church, allowing the marriage of priests. This council, also called Quinisext, as being meant to supplement the 5th and 6th œcumenical councils, is not accepted by the Roman Church.

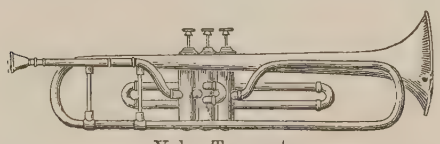
Trumbull, JONATHAN, an American patriot, was born at Lebanon, Connecticut, 12th October 1710, and graduated at Harvard in 1727. He was successively judge, deputy-governor, and governor (1769–83) of Connecticut, and took a very prominent part in forwarding the war of independence. Washington placed great reliance on him, and frequently consulted him: to this habit, and his phrase, often repeated when in doubt, 'Let us hear what Brother Jonathan says,' has been traced the name which stands (though not so generally now as 'Uncle Sam') for a personification of the United States as 'John Bull' does for England. Trumbull died 17th August 1785. There is a Life by I. W. Stuart (Hartford, 1857).—His son John (1756–1843) was eminent as a painter. His best works are several portraits of Washington and others, 'The Battle of Bunker Hill,' 'Death of Montgomery,' and four paintings in the capitol at Washington, representing the Declaration of Independence, the surrender of Burgoyne and of Cornwallis, and Washington's resignation. A gallery of his historical pictures, of considerable value for their portraits, &c., became the property of Yale College in return for an annuity of $1000. See YALE UNIVERSITY.

Trumpet, an ancient wind-instrument (the curved *lituus* of the Romans), is formed of a long, narrow, straight tube, bent twice on itself, the last fifteen inches tapering into a bell, and sounded by means of a cupped mouthpiece (for figure of mouthpiece, see HORN). The simple form of the instrument has been used from 'time immemorial' as a military signalling instrument, being specially attached to the cavalry and artillery branches, while the Bugle (q.v.) served the infantry. For trumpeter, see BAND (MILITARY). From its power and brilliancy of tone it has also been a favourite instrument with many composers of orchestral music. The compass of the natural trumpet comprises the harmonic series (see HARMONICS) up to about G (first space above the treble clef), the fundamental tone being alterable by

means of crooks. Higher registered instruments, requiring great skill on the part of the performer, were in fairly common use from the 16th to the 18th century; Bach wrote trumpet parts up to D and E above the treble clef. A slide arrangement,



adapted from the trombone, invented some time during the 18th century and subsequently improved by the celebrated player Harper, gives most



Valve Trumpet.

of the chromatic scale. A simpler form with three valves, brought out first by Stölzel in 1815, gives all the scale and is now generally used. The tone of the Cornet (q.v.) is inferior to that of the trumpet. Valve trumpet parts are always written in the key of C major, while the crooks generally used give the instrument a range of the following keys: F, E, E♭, D, C.

Trumpeter (*Psophia*), a genus of crane-like birds. Only half-a-dozen species are known. The Trumpeter (*P. crepitans*—the *Agami* of the Indians) is described by Schomburgk as occurring in large flocks throughout British Guiana, chiefly in damp forests near the coast. They are very easily tamed, and their flesh is palatable. The name trumpeter refers to the loud ventriloquistic call, with which the enormously developed windpipe has probably to do. One of the American swans, *Cygnus buccinator*, is also called Trumpeter.

Trumpet-fish, or SNIPE-FISH (*Centriscus*), a genus of fishes referred to the family Fistularidæ,

Trumpet-fish (*Centriscus scolopax*).

or to a special family Centriscidæ. The compressed and somewhat oblong body is covered with small spiny scales; the toothless mouth lies at the end of an elongated tubular snout; the second ray of the first dorsal fin is a strong toothed spine, and the ventral fins, which lie in a groove, are also serrated. The fish measures about 5 inches in length; its colours are rose or reddish green above, silvery beneath. It sometimes occurs on the south coast of Britain, and is common in the warmer European waters. It is sometimes called sea-snipe, and, as this suggests, is esteemed a delicacy, and is often to be seen in the markets of Italy. The name 'trumpeter' is also given to a well-flavoured Tasmanian and New Zealand fish (*Latris hecateia*), not far removed from the Serranidæ and Perches.

Trumpet-flower, the popular name of various plants which produce large trumpet-shaped flowers. The genera Bignonia, Catalpa, Tecoma, all belonging to the Bignoniaceæ, and Solandra, belonging to Solanaceæ, are examples of the plants commonly named trumpet-flowers. Species are: *Bignonia capreolata* ('Cross-vine'), *Catalpa bignonioides* ('Indian Bean'), *C. cordifolia* ('Western Catalpa'), *Tecoma radicans* ('Trumpet Creeper'), all North American; *Catalpa Bungei* and *C. Kæmpferi*, *Tecoma grandiflora*, East Asiatic species. *Solandra grandiflora*, with gigantic flowers, seems to have a special liking for *Ficus mexicana*, from which tree its festoons can often be seen hanging down.

Trunk-fish, a name for the Coffer-fish (q.v.).

Trunnion. See GUN.

Truro, a city of Cornwall, of which it is considered the metropolis, though Bodmin is the county town, stands 12 miles NNE. of Falmouth and 54 W. of Plymouth, at the junction of the Allen and the Kenwyn, here met by a tidal inlet, the Truro River, whose banks present beautiful scenery, and which admits vessels of 100 tons to the quays of the town. The ancient Cornish bishopric of Truro was revived in 1876. The cathedral, which occupies the site of the 16th-century church of St Mary, was begun in 1880, and consecrated in 1887, but was not completely finished till 1910; it is a granite Early English structure, designed by J. L. Pearson, measures 275 feet by 111 across the transepts, and has a central tower 250 and two western towers 204 feet high. Other buildings are the Italian town-hall and market-house (1847); the Tudor public rooms (1868), with the county and Bishop Phillpott's libraries; the grammar-school (1546); and the Royal Cornwall Infirmary (1779). Foote, Bone, Martyn, and the Landers were natives, and Dr Wolcot practised here. A very ancient municipal borough, Truro returned two members to parliament from 1239 till 1885. Pop. (1921) 10,833.

Truro, a Nova Scotian iron and woollen manufacturing town, at the head of Cobequid Bay, 55 miles NNE. of Halifax, has an agricultural college; pop. (1921) 7562.

Truss. See HERNIA.

Trust, an arrangement by which property is handed to or vested in a person, in the trust or confidence that he will use and dispose of it for the benefit of another. At Rome such an arrangement was called a *Fidei-commissum* (q.v), and at first the honour of the trustee was the only security for the performance of his duty; Augustus gave legal validity to trusts, and appointed a special prætor to enforce them. In England land was in early times frequently conveyed to persons in whom the owner had confidence, that they might hold it to the use of other persons indicated by him. The courts of law looked only to the legal title, and took no notice of the uses to which the land was held; but the Chancellor would compel a 'feoffee to uses' to do his duty. The use was turned into a legal estate by statute in 1536, but the equitable powers of the Chancery remained, and were freely used to enforce any trust, whether relating to land or to personal property. Trusts of land must be declared in writing, but this rule does not apply to trusts raised by implication or construction of law. Thus, if A purchases land with the money of B, he holds it as trustee for B, although there may be no written agreement between them. The person who holds property in trust is a *trustee;* the person for whose benefit he holds is called *cestui que trust* (he that has the benefit of the trust). In declaring a trust no particular words are necessary, but the intention of the party making it must be clear. Thus, in wills, a testator sometimes uses words which do not amount to an express trust, but speaks of his 'wish and desire,' or his 'confidence,'

that the executor or trustee shall do certain things. These are called in the law precatory trusts; they are enforced if no uncertainty exists as to the purposes or mode of carrying out the trust. But if a testator merely recommends an executor to 'consider certain persons,' 'to be kind to them,' or 'to do justice to them,' or 'to make ample provision for them,' &c., such expressions are treated as too vague to be binding, and therefore the executor may disregard them, or use his own discretion. A trustee's is not a compulsory office, but gratuitous, and therefore he need not accept the office unless he pleases. But if he once accept he is not at liberty afterwards to renounce, unless the trust-deed contain a provision enabling him to do so, or the court for good reasons discharge him. A trustee cannot delegate the office to a third person, but continues personally bound to do his duty. Where there are several trustees appointed the office is considered joint, so that if one dies the survivors continue to exercise the office. As a general rule, all must join in doing any act; but if the trust is of a public nature a majority may bind the minority. Each trustee is liable only for his own acts or defaults, and this is so even though, for form's sake, he join his co-trustees in signing a receipt, if he can show that he never received the money in point of fact. Nevertheless when money lies in the hands of one trustee the others ought not to be satisfied with his mere statement that the money has been invested by him, but should see that it is actually done. Another rule is that a trustee is not allowed to make a gain of his office; and so jealous is an English court of this rule that trustees have sometimes been restrained by the court from shooting over the trust estate. A trustee is personally liable if he trade with the trust funds, or buy shares in a joint-stock bank; for, even though the trust-deed authorise this to be done, he will be liable to pay the debts of the trading concern, though far exceeding the amount of the trust funds. So, if a trustee is a solicitor, and does legal business for the estate, he will not be allowed to charge for his care and trouble, but at most will be allowed only the costs out of pocket. It is seldom, therefore, that a trustee can get any benefit to himself from the trust estate. Formerly if *cestui que trust* died without heirs land held in trust belonged to the trustee, but the rule has been altered by statute, and the escheat is now to the crown. It is the duty of a trustee to keep the trust funds safe; and if they consist of moneys, then he ought to invest them in government stock, and not let the money lie unproductive. He is not entitled to lend the money on personal security, or in the shares of any private company; but he may invest in mortgages, unless he is forbidden by the deed or will. If there is, therefore, no power to invest in mortgages, the trustee must invest in consols or in some other security authorised by the orders of the Supreme Court. The trustees, as a general rule, must pay interest whether they invest the funds or not (if they have had time to invest) to the *cestui que trust;* and they must account for all the profits they make with the trust funds, whether rightly or wrongfully. If a trustee has grossly misconducted himself as to the trust funds he will be charged 5 per cent. interest, and sometimes compound interest. A trustee is entitled to be indemnified for all the reasonable expenses or outlay attending the execution of the trust, but he must in general bear the loss of any mistake as to the law; but if there is any peculiar difficulty in carrying out the trust, he is entitled to take the opinion of, or even to throw the chief management upon, the Chancery Division of the High Court, as the only safe protection. When trustees are guilty of gross negligence, mismanagement, or misconduct the Court will remove them and appoint others (see Lewin on Trusts). By the Trusts (Scotland) Act, 1921, which amends the law relating to trusts in Scotland, trustees under any trust may, unless specially prohibited by the constitution or terms of the trust, invest the trust funds in the purchase of government securities of the United Kingdom, or securities with parliamentary guarantee of interest; stock of India, colonial stock (subject to restrictions); Bank of England, London County Council or Metropolitan Water Board, county or town councils in Scotland (if redeemable) and of certain municipal corporations in Great Britain, and certain British railway securities; in loans on any of the foregoing, on real and heritable security in Great Britain, and on certain securities. The Public Trustee Act of 1906, empowering the State through an official Public Trustee to act as executor or trustee for any person who may desire it, came into force in 1908. See ASSOCIATIONS, TRUSTS, AND CARTELS.

Truxillo. See TRUJILLO.

Trygon. See STING RAY.

Tryon, SIR GEORGE, K.C.B. (1832–93), vice-admiral, entered the navy in 1848, was at Sebastopol, became captain in 1866, and admiral in 1884. He was commander-in-chief in the Mediterranean from 1891 till the disastrous collision (29th June 1893) off the coast of Syria, when his flagship, the *Victoria*, by his mistaken order, collided, capsized, and sank, with her commander and great part of her crew. While admiral on the Australian station he devised, in 1886, the scheme for a local auxiliary squadron, from which systems of naval defence in the colonies have developed. See Life by Penrose FitzGerald (1897).

Trypanosomes, flagellate protozoa (see INFUSORIA) parasitic in blood, sometimes causing disease. See SLEEPING-SICKNESS, TSETSE.

Trypanosomiasis. See TSETSE.

Trypsin is a digestive ferment which occurs in the secretion of the pancreas. See DIGESTION, FERMENTATION.

Tsad. See CHAD.

Tsana. See TANA.

Tsangpo, or TSANPO. See BRAHMAPUTRA.

Tsar. See CZAR.

Tsaritsyn. See STALINGRAD.

Tsarskoye Selo ('Imperial Town'), 15 miles S. of Petrograd, was an imperial residence, with two great palaces and parks; pop. 15,000.

Tschaikowsky, PETER ILYITCH, composer, was born 25th April (7th May) 1840, at the mining-town of Votkinsk in Vyatka, Russia. His father, a mining engineer in the imperial service, soon after became director of the technological institute at St Petersburg, whither the family removed in 1850. There Tschaikowsky studied law, and for three years was an official of the ministry of justice. He was a good amateur musician, with a taste for Italian opera, for Mozart, and for Glinka. When the Conservatorium was established by Rubinstein he became a student under Zaremba, and by Rubinstein's advice abandoned law (1863) for the profession of music. Nicholas Rubinstein (Anton's brother) then founded the Moscow Conservatorium, and Tschaikowsky was professor of composition and history there from 1866 to 1878. At Moscow he wrote a treatise on harmony, was music critic for two periodicals, and composed assiduously. His works were often slow to make their way, both with musicians and with the public. Some of his failures of this period ultimately gained favour. Others he burned or transformed into new shape. The Rubinsteins were too conservative to

approve of such works as the first symphony (1866), the B flat minor piano concerto (1874), or the string quartette in F (1874). Curiously enough, Tschaikowsky was himself conservative in opera. Opera strongly attracted him, and he essayed it again and again, with limited success. *Oprichnik* (1874) and *Eugene Onegin* (1878) alone kept the stage. Music for an abandoned opera was turned into a symphonic poem, *Francesca da Rimini*. Other works of the Moscow period are the first three symphonies, *The Tempest* symphonic poem, the string quartets, much piano music, and songs, these last of inferior interest.

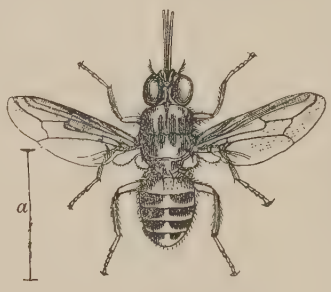
Tschaikowsky was of a diffident, melancholy temperament. His music often expresses the deepest gloom and despair. He had already had to go abroad in 1876 to recover from a nervous breakdown, but in 1877 a climax came in a disastrous marriage, contracted in compassionate quixotry, which drove him after a few weeks to St Petersburg, where he fell seriously ill, and stood in the river in the hope of dying of exposure. Under the care of his brother Anatol he then went to Switzerland and Italy, and completed not only his popular but unequal *Eugene Onegin*, but one of his masterpieces, the fourth symphony. For a short time he resumed teaching at the Conservatorium, but he was enabled to resign his chair by the well-judged action of Mme. von Meck, a rich admirer of his music, whom he corresponded with, but never met. This lady made him a considerable money allowance until 1890, whereby he was able to give his main energy to composing. From this time his life was spent at St Petersburg, and afterwards near Klin, north-west of Moscow, with tours in Italy, America, England, and elsewhere. He wrote more operas and symphonic poems, orchestral suites, a second and third (unfinished) piano concerto, the *1812* overture (1880), those two light and delicate ballets *La Belle au Bois Dormant* and *Casse-Noisette*, and two of the greatest and most overwhelmingly tragic symphonies in all music, the fifth and the sixth or 'Pathetic.' The last-named was completed in August 1893. On the 25th of October (6th of November) he died of cholera at St Petersburg. Tschaikowsky's music combines Italian melodic sensuousness (his favourite composer was Mozart) with a peculiar individual melancholy that almost amounts to hysteria. He is intensely human and intensely introspective. It is a curious paradox that while his operas fail by being too lyrical, his symphonies gain enormously by being dramatic, while his orchestration is always brilliant and highly coloured.

See his Life and Letters by his brother Modest Tschaikowsky (1901; abridged translation by Mrs Newmarch, 1905); Mrs Rosa Newmarch, *Life and Works of Tschaikowsky* (1900; ed. Evans, 1908); and the article in Grove's *Dictionary*.

Tschudes, a small branch of the Baltic or Western Finns, akin to the Esths, include the Votes in north-west Ingermanland, and the Vepsas near Lake Ladoga.

Tschudi, Aegidius (1505–72), of Glarus, wrote the standard *Schweizerchronik*, which, as continued by Johannes von Müller, though it has been proved to contain baseless legends and fables, has great interest and literary merit, and has accurately preserved the text of many ancient documents which would otherwise have been lost.—To the same family belonged Johann Jakob von Tschudi (1818–89), the eminent traveller and naturalist, born at Glarus. After completing his studies at Leyden and Paris, he undertook (1838) a voyage round the world; but circumstances restricted his design to an investigation into the natural history and ethnography of Peru, where he remained for five years. He settled in Austria, and from 1866 till 1883 was Swiss ambassador at Vienna. His writings comprise works on the batrachians, the *Fauna Peruana* (1844–47), on the Quichua language, on Peruvian antiquities, a Peruvian drama, and sketches of his travels in South America.

Tsetse (*Glossina morsitans*), a dipterous insect which is a terrible pest of some parts of South Africa. It resembles the common house-fly in shape, and is of a brown colour, with four yellow bars across the abdomen. The wings in repose project considerably beyond the abdomen. It is remarkably alert, at least during the heat of the day, and dexterously avoids any attempt to catch it with the hand. Its bite conveys the disease called Nagana to cattle, horses, goats, sheep, and other domesticated animals. The disease is due to a Protozoon parasite—a Trypanosome—which lives in the blood of the wild animals of the country. These wild animals are accustomed to the parasite, and appear to be unaffected by its presence; but its transference to new-comers is usually fatal. Smearing the cattle with unpleasant stuffs before they enter the often narrowly circumscribed 'fly-belt' seems to be sometimes an effective preventive, and other counteractives are being devised. *Glossina palpalis* is responsible, with *G. morsitans*, for disseminating the parasite (*Trypanosoma gambiense*) of Sleeping-sickness (q.v.), perhaps the most terrible of all human diseases.



Tsetse (*Glossina morsitans*): *a*, natural size.

Tsi-nan, capital of Shantung province, China, 100 miles from the Gulf of Pe-chi-li, manufactures silk and glass; pop. 250,000.

Tsing-tao, a treaty port of China, situated in an advantageous position on the peninsula which separates the bay of Kiao-chau from the Yellow Sea. It is frequently referred to as Kiao-chau (q.v.) though strictly Kiao-chau lies on the eastern side of the bay. Tsing-tao, from being a mere fishing village developed enormously under German control (1898–1914) and became of considerable strategical importance. Progress was continued under the Japanese, but since the resumption of Chinese control a relapse has threatened.

Tsitsihar, a town of Manchuria, on the Vladivostok branch of the Trans-Siberian Railway, 250 miles SW. of Aigun; pop. 30,000.

Tsong-kha-pa. See Lamaism.

Tsu, a maritime town of Japan, 50 miles ESE. of Tōkyō, with many fine temples; pop. (1925) 52,536.

Tsuga, a genus of conifers, including the Douglas fir (*T.* or *Abies Douglasii*) and the hemlock spruce (*T.* or *Abies canadensis*). See Fir.

Tsuruoka, a town of the main island of Japan, 70 miles NE. of Niigata; pop. (1925) 31,830.

Tsu-shima, a Japanese island (two islands at high water), 40 miles long, dividing the Korean Strait into two channels. In the main channel on May 27–28, 1905, the Russian Baltic fleet was annihilated by Togo.

Tuam, a town of Galway, 130 miles NW. of Dublin, is the seat of a Roman Catholic archbishop and of an Anglican bishop; pop. 3000.

Tuamotu. See Low Archipelago; Polynesia, &c.

Tuareg, or Tuarik. See Touareg.

Tuat. See Touat.

Tuatara. See Sphenodon.

Tuba (the straight trumpet of the Romans), a name sometimes given to the larger members of the Saxhorn (q.v.) family, but usually confined to the Bass Tuba, the lowest-toned brass instrument in the modern orchestra. It was created in 1835 by Wieprecht and Moritz, and first used to any extent by Wagner. The tone is broad, and the compass, with the use of 3 or 4 valves, extends from F an octave below the bass clef to F above the bass clef.

Tube. See Pipes.

Tuber, a thick and fleshy subterranean stem, filled with starchy matter, which serves as a store of food material for the plant, and especially as a stock in trade for the young plants which often grow from the buds of the tuber to begin life upon. These buds, together with the minute scales in whose axils they occur, show that tubers are not Roots (q.v.). The true roots arise from the tubers. The potato is the most familiar example. The buds in this case are called 'eyes.' If they are cut off the tuber and set in the ground they grow into new plants. This is the method adopted by gardeners for the propagation of the potato plant. It has been observed that the ordinary aerial buds show a tendency, occasionally, to become tuberous. This is taken advantage of by gardeners, who, by surrounding the lower part of the stem with earth, cause the buried buds, which would normally grow into branches, to become tubers. The Jerusalem artichoke (*Helianthus tuberosus*) is another common tuber. Many use the word, not as defined above but generally, for any swollen plant structure (stem or root) which serves as a storehouse of reserve material. The subterranean fructifications of a group of fungi, the Tuberaceæ or Truffles (q.v.) are called tubers.

Tubercle.—*Historical.*—The word tubercle was first applied to the small nodules which occur in the lung and elsewhere in the disease tuberculosis, or consumption, by Franciscus Sylvius (1614–72). So constant are these nodules, and so characteristic of the disease, that the term has come to be applied to such lesions only as they occur in this particular disease, the disease itself being known as tuberculosis. The adjective tubercular or tuberculous is employed to signify belonging to the disease tuberculosis. To the causal germ of the disease the name tubercle bacillus or *Bacillus tuberculosis* is given.

At first 'tubercles' were regarded as being enlargements of minute glands. Baillie (1761–1823) was one of the first to object to this view, and to regard the condition as a 'new formation' in the cellular tissue between the lung air-cells. Knowledge regarding tubercle was greatly advanced by Bayle and Laennec in the early years of the 19th century. Rudolf Virchow (1865) was the first to describe the microscopic appearance of the tubercle nodule as a cell aggregation, but he regarded the condition as a tumour formation, including it among the granulomata, or tumours composed of granulation tissue. In 1865 Villemin discovered that tuberculosis was inoculable into rabbits, and the term 'infective granuloma' was used to characterise the condition. In 1876 Ziegler showed that the microscopic appearances of the disease were exactly those found in inflammation generally; and in 1882 Koch discovered the irritant which produced the peculiar type of inflammation characteristic of tuberculosis.

The term 'struma' was applied by Celsus, who lived at the commencement of the Christian era, to enlarged glands in the neck, a condition undoubtedly, in a majority of cases, due to tuberculosis. Scrofula (from *scrofa*, a pig) was a term applied first by certain Roman writers to a similar enlargement of such glands of an extreme degree, the origin of the term being the pig-like expression of individuals suffering from the disease. Both these terms have been dropped from general use, since it has been recognised that the conditions they stand for are merely special manifestations of tuberculosis.

Causation.—The organism now universally recognised as the cause of tuberculosis (*Bacillus tuberculosis*) was discovered by Robert Koch sometime during the year 1881. The announcement of this discovery was made at a meeting of the Physiological Society of Berlin University on 25th March 1882. So complete and thorough had been Koch's work that he was able at that meeting to show that the germ described by him fulfilled all the postulates laid down by himself at a later date as requiring proof if an organism is to be causally related to a disease. (See Germ Theory.)

This organism, as it occurs in cultures and in its lesions, is usually rod-shaped, although occasionally long branching forms are found. It varies much in length, being usually one ten-thousandth to one five-thousandth of an inch long. It is slender (one sixty-thousandth of an inch in breadth), and may be straight or slightly curved. It has no capacity for individual movement, and occurs chiefly in masses. It is composed of protein substance, with fatty material, and salts of sodium, potassium, calcium, and magnesium. It is a difficult organism to stain, the staining fluid requiring the assistance of heat and some mordant, such as carbolic acid, but once stained it resists the decolorising actions of reagents such as acids and alcohol. It stains irregularly, some portions of the germ being more deeply stained than others (fig. 1).

Fig. 1.—Tubercle Bacilli in phthisical expectoration (× about 1500 diameters): *a*, bacilli; *b*, catarrhal cells. (After Crookshank.)

Calmette and his co-workers have demonstrated (1927) that material extracted from tuberculous lesions after being passed through a fine porcelain filter is still infective for animals such as guinea pigs. This would indicate that a form of the bacillus, possibly a spore, belongs to the filterable (ultra-microscopic) group of organisms.

The tubercle bacillus is cultivated with considerable difficulty on artificial media. It will grow most readily on blood serum and on egg media, also upon ordinary media, such as meat extract, agar-agar, and potato, to which glycerine has been added. Growth takes place very slowly after a culture-tube has been inoculated, none being visible for ten to fourteen days.

The usual method of staining is by means of carbol-fuchsin, heating the stain until it steams. The section, or film, is then treated with acid spirit in order to take the stain out of everything except the organism. Methylene-blue is usually employed as a counterstain.

On artificial media, such as egg, the organism grows as a thin, white, pale yellow or pink film with a wrinkled surface. Raised nodules of growth develop here and there with rough, irregular sur-

faces. The germ will only grow in the presence of oxygen.

Resistance of the Germ.—The tubercle bacillus is a relatively resistant germ. This power it owes in large measure to the fatty material incorporated in its substance. Dried sputum, if kept in the dark, remains capable of producing infection for six to eight months. This point is of great importance in relation to the dissemination of the disease by dust. The organism has been found alive after several weeks in a putrefying fluid. Raising the temperature of a fluid in which the germ is to 100° C. (i.e. the boiling-point of water) will rapidly kill the organism. Hence the boiling of milk, even for a very short time, will render it innocuous from this point of view. On the other hand, in the dry condition the organism will resist a temperature of 100° C. for an hour. At a temperature of 60° C. in a fluid the germ is killed in fifteen to twenty minutes. This fact is the foundation for the process of the Pasteurisation of milk. At the same time, it should be remembered that the lid of the vessel must be closed if this temperature is to be effective, and no solid masses or clots must be present. To destroy sputum or other infectious material it must be left in contact with carbolic or lysol 5 per cent. for twenty-four hours in order to ensure proper penetration of the antiseptic. It should be remembered that one of the most effective agents for destroying the tubercle bacillus (as well as other germs) is sunlight. Cultures of the germ are killed within two hours by exposure to the direct rays of the sun.

Types of the Germ.—The germ varies somewhat in its characters, according to the source from which it has been obtained. Certain types can be distinguished: (1) A human type, which is obtained from the majority of lesions in the human subject (practically all cases of pulmonary tuberculosis), and occasionally from animals such as the pig. This type grows more readily than does the bovine type upon artificial media. (2) A bovine type, which is obtained from cases of the disease in cows, horses, pigs, cats, &c., and is not infrequently found in the human subject, especially in young children in tubercular glands, intestinal and bone tuberculosis. This type tends to be shorter and thicker than the human type; it grows much less readily upon artificial media, and it produces a much more rapidly spreading disease in the rabbit. (3) An avian type, which is found in birds, and occasionally in pigs, and, very occasionally, in man. (4) A type found in fishes and other cold-blooded animals. These types are fairly constant in their characters, and have up to the present time resisted all attempts at transformation into other types.

Portals of Entrance.—The tubercle bacillus may enter the body by one of three paths: (1) the respiratory tract, including the nose, tonsils, windpipe, and bronchial tubes; (2) the intestinal canal; (3) the skin. By far the commonest path of entrance is the respiratory tract, the organism being inhaled in the form of infected dust from rooms or the street, or in the form of spray directly from a coughing consumptive. Owing to the fact that a large percentage of milking cows suffer from tuberculosis, milk is not infrequently the means of introducing the germ into the intestine. In the bowel itself ulceration may be caused, or the germ may be absorbed, and affect first the glands of the abdominal cavity. This mode of infection occurs chiefly in children. The skin is infected only in rare instances, such as in the case of veterinary surgeons, doctors or attendants in consumptive hospitals.

The tubercle bacillus occurs in its lesions in variable numbers. In some cases of rapidly progressive type the number may be very large. It is estimated that a consumptive may expectorate as many as three million tubercle bacilli in twenty-four hours. As a rule, however, the organisms occur in the tissues, and in the spit in small numbers.

Toxins.—The tubercle bacillus in producing its poisonous and destructive effects acts largely

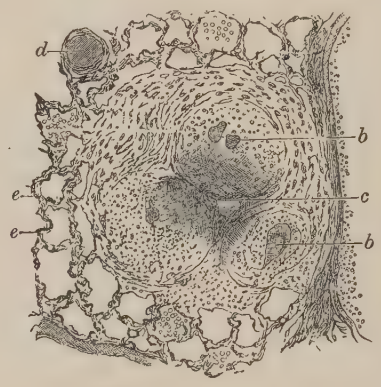


Fig. 2.—Tubercle of Lung (× 50 diams.):
bb, giant cells; *c*, centre of tubercle beginning to caseate; *d*, branch of pulmonary artery; *e*, alveolar framework of lung. (After Hamilton.)

through the medium of a toxin which it secretes. This poison occurs within the body of the germ; also, to a lesser extent, in the medium in which it is growing. The toxin is extracted from the germ and employed in the form of what is called tuberculin both as a test for the existence of tuberculosis and in the treatment of the disease.

Fig. 3.—Giant Cells from Tubercle of Lung (460 diams.).
The peripheral arrangement of the nuclei is well seen, as also the reticular meshwork external to the cell. (After Wilson Fox.)

Lesions produced in the Tissues.—When tubercle bacilli are introduced into the tissues of the animal body they are attacked by the phagocytic cells from the blood and from neighbouring parts. Owing to its resistant character it takes some time for cells to destroy the germ; hence the cells tend to become aggregated together into masses round the bacilli. This cell aggregation, which is the 'tubercle' or tubercle follicle previously mentioned, has a very constant and characteristic appearance under the microscope. It is built up of two main types of cells (figs. 2 and 3):

(1) Large branched or spindle-shaped cells which arise chiefly from the fixed connective-tissue cell by a process of proliferation. These cells occur towards the centre of the follicle. Many of them contain more than one nucleus, and one or more in each follicle are exceptionally large, containing

20–40 nuclei. These are known as 'giant' cells. These giant-cells, first described by Rokitanski (1855), are very characteristic of the disease tuberculosis. The nuclei are arranged in a circle, or part of a circle, at the periphery of the cell. In the centre is a clear, finely granular area.

(2) At the periphery of the tubercle, outside the area of epithelioid cells, is a zone of small, round cells with dark-staining nuclei, which resemble the small leucocytes of the blood. These originate in part from the blood, in part from connective-tissue cells, and are known as lymphocytes. Tubercle nodules are often massed together, the individual follicles being separated by strands of fibrous tissue. Under the influence of the poison liberated by the tubercle bacillus the cells frequently die, undergoing necrosis of a special type, which from its naked-eye appearance is known as 'caseation.' As the result of this change the cells lose their identity, cease to stain, and break down, to form a granular, structureless debris. Tubercle bacilli are found in tuberculous tissue usually only in small numbers, occurring within the cells, or, more commonly, in the necrotic caseous areas. So constant and characteristic are the above microscopic appearances that on finding them the observer can without hesitation say that living tubercle bacilli are, or have been, in that particular tissue. A point of interest is that the tubercle follicle does not contain vessels (a fact observed first by William Stark, 1788).

The above cellular changes are found in tuberculous disease wherever it occurs throughout the body —whether in bone, brain, lung, skin, or intestine. If the lesion be near one of the surfaces of the body—e.g. skin or internal surfaces, such as the intestine air-passage—the dead, caseous material is discharged, and a cavity, or ulcer, results. When this is the case other germs infect the raw surface, grow upon it, and so add their injurious effects to those of the tubercle bacillus.

To the unaided eye these tubercles appear, when composed of living cells, as minute gray areas. When they have undergone the caseous change, they show in their centre small opaque white or yellow spots. The resemblance between tubercles of this kind and millet-seed was observed by Manget in 1700; hence the use of the term miliary tuberculosis, where the disease takes the form of a dissemination of small tubercles through an organ or through all the organs of the body. Frequently larger nodules are formed from the coalescence of a number of tubercles. In the lung, in addition to the formation of tubercles there is always a filling up of the air-sacs with cells and exudate. Such consolidated areas undergo, just as the tubercles do, a necrotic, caseous change. The term 'caseous' was given, as indicated above, because of the resemblance of the necrotic material to dry cream-cheese. The term was first applied to tuberculous lesions by Baillie. Calcification may occur in old caseous areas.

Mode of Spread.—Having started at one particular point in the body—lung, tonsils, intestine, skin, &c.—the disease tends to spread in various ways: (1) by continuity of tissue, creeping from one part to another; (2) by the lymphatic vessels, through organisms being absorbed by the lymph and carried to other parts of the lymphatic system —thus it is that after starting at some point the nearest lymphatic glands soon become enlarged and tuberculous; (3) by the blood-vessels, the organisms gaining access to the interior of the blood-vessel, usually owing to a focus becoming adherent to and discharging itself into a thin-walled vessel such as a vein—when this occurs the disease spreads itself throughout the body, miliary nodules being found in all the internal organs; (4) spread may also occur, in the case of the lung, by the air-passages, owing to infected material being coughed up and then inhaled into other portions of the same lung or into the other lung. In the case of the urinary tract, spread may take place from kidney to bladder by way of the ureter.

As previously stated, the lesion when it reaches a surface ulcerates. Thus tubercle foci in the lung become connected with, and eventually open into, air-passages, discharging by this means their caseous material. It is in this way that lung-cavities form.

Tuberculin. See TUBERCULOSIS.

Tuberculosis, or PHTHISIS, popularly known as consumption or decline, has been known from the very earliest times. Babylonian records depict a condition recognisable as such, but we owe the first description of the disease to Hippocrates (460 B.C.), and little was added to this for many centuries. From these remote times consumption has been the most wide-spread and prevalent disease among mankind, and has been named the great white plague. The term consumption is generally used by the laity to indicate pulmonary tuberculosis (*phthisis pulmonalis*), a process of destruction of the lungs, of varying intensity and rapidity, combined with progressive symptoms and emaciation, but tuberculosis is really a disease which may affect any system in the body. It is essentially a wasting disease and very frequently a fatal one, and was well termed by Bunyan 'Captain of the Men of Death.' Towards the end of last century it was estimated that one-seventh of the total deaths in Europe was due to consumption.

Distribution.—No country or people is exempt, though the distribution is not equal. In all latitudes, altitudes, and climates tuberculosis is rife, especially in lowlands and temperate zones. It is less frequent in high lands and those exposed to great cold, and probably in tropical countries, though in these last the disease is more acute and rapid. One factor which appears to exercise an important influence upon its prevalence is the dampness of the soil, and various observers, both in this country and in America, testify that its incidence bears a direct ratio to the degree of moisture in the soil. Contrariwise, its comparative rarity in high altitudes is due to the dryness and purity of the atmosphere. While all races suffer from consumption, natives and aborigines are particularly liable to infection, and contract a virulent and rapid type of the disease.

Though clinically consumption has been well known from ancient times, and its symptoms recognised and studied, its cause has been a subject of discussion and diverse opinions throughout. It is interesting to note that even in the time of Hippocrates it was regarded as contagious, a view shared later by Galen, and still later by Sylvius (1614–72), who classified the disease in three forms, viz. nodules, enlarged lymph glands, and scrofula. To Laennec is due the modern view of the essential unity of tuberculosis; he contended that small granular masses in the lung, termed Tubercle (q.v.), were the cause of consumption, and his paper, published in 1819, showed him to be far ahead of his day as an accurate observer. He laid the foundation of the accurate clinical teaching of to-day. Virchow and others held that scrofula and tuberculosis were distinct diseases, that tubercles did not explain all cases, and propounded the view that consumption was the result of a chronic inflammatory and exudative change in the lungs.

The discovery by Koch in 1882 of the specific organism, *Bacillus Tuberculosis*, which he believed to be present in all cases of tuberculosis, definitely

settled the question of the cause of the disease, though it did not silence for a considerable time the contending views previously held. Koch satisfied himself that the bacillus was present in all cases of open (active) tuberculosis, that the inoculation of animals with the infected sputum caused the disease in them, that the bacilli obtained from these animals could be grown on artificial media, and that the bacilli so grown produced tuberculosis in turn when injected into animals.

The *tubercle bacillus* is a minute rod-like structure, easily demonstrated in the sputum of consumptive patients by suitable staining, and readily cultured on artificial media. All Koch's assertions have been abundantly confirmed, both clinically and experimentally, and have profoundly modified former teaching.

But though the bacillus is recognised as the actual cause of the disease, there are many other factors which have a very important bearing upon its incidence. It is no longer seriously contended by authoritative observers that Heredity (q.v.) *per se* transmits tuberculosis, it has not been proved that the actual disease has been transmitted from mother to unborn child, but it can be maintained on surer grounds that there is present in many families a predisposition or Diathesis (q.v.) which is transmitted from one generation to another. This is really to be regarded as a lessening of resistance to consumption. Even in conceding this there is a possibility of a fallacy as to whether this diathesis is a cause or an effect. Since it is now universally admitted that, in almost all cases, tuberculous infection occurs in childhood, it is possible that the symptoms of this infection may be in many instances wrongly interpreted as a disposition to and not as the disease itself.

It is popularly believed that the marriage of near relatives results in tuberculous children, but beyond the fact that such marriages increase the liability to predisposition when any family weakness exists, there is no evidence in favour of this view.

Age and Sex have a very pronounced influence upon the distribution of consumption. The disease is decidedly more common amongst males than females, except between the ages of five and twenty years, when more females die of it than males. Though infection takes place in childhood, consumption most frequently manifests itself between adolescence and thirty years, while more than half the total deaths occur between twenty and fifty years. The maximum takes place in men between forty-five and fifty-five years. In England the deaths from all forms of tuberculosis in 1925 were 40,387, in Scotland 5390. In infancy up to about two years of age 90 per cent. of the deaths from tuberculosis are due to tuberculosis of other systems, and only 10 per cent. to pulmonary tuberculosis, but after adolescence these figures are reversed, and nearly 90 per cent. of the deaths are from pulmonary tuberculosis.

Density of Population certainly plays a part upon the frequency of consumption, and statistics show that the frequency as well as the mortality of the disease is much greater in large towns, and more especially in the poorer and most overcrowded parts of these towns, while in rural districts the death-rate is comparatively low. Where there is overcrowding this factor never exists alone; we have also *bad housing* and general *insanitary conditions*. All large cities can show tenements, and even whole streets, where consumption is practically endemic, and where there are cases in nearly every household. It is generally found that such areas are air-blocked, back-to-back houses, frequently in culs-de-sac; insufficient ventilation, lack of sunshine, damp, and dirt, all tend to create these nests of consumption. Add to these conditions the poverty and malnutrition which are only too common in such surroundings and there is an ideal soil for it to flourish in. Another contributory factor is *occupation;* many callings show a very high mortality-rate from tuberculosis; sedentary employees, e.g. tailors, clerks, seamstresses, are particularly prone to fall victims. In this connection, however, it must be recognised that certain occupations attract a less robust type of individual, and again their working environment is not infrequently ill-ventilated and insanitary. Other trades particularly liable to infection are those in which there is inhalation of dust particles, e.g. stone-cutting, knife-grinding, and metal-polishing. The constant irritation of fine metallic dust causes chronic changes in the delicate structures lining the bronchial passages and air-cells, and may prepare the way for ultimate infection. Coal-miners, though constantly exposed to fine carbon dust, are found to be less liable to consumption than the general population.

Individual *habits*, carelessness in observing rules of health, uncleanliness, alcoholism, exposure, all predispose to infection by lowering the resistance. Another frequent cause of infection or lighting up of old infection is the occurrence of other diseases, e.g. pleurisy, influenza; after epidemics of the latter there has generally been found an increase in the number of cases of consumption. Even in the presence of these contributory factors and despite the fact that consumption is infectious, it requires contact of an intimate nature to bring about infection. The most frequent, as well as the most dangerous, source of infection is the *sputum* or expectoration of consumptive patients. This adheres to bed-clothes, carpets, clothing, wall-papers, &c., dries and mingles with dust, and in this form is readily inhaled, thus carrying the specific organism to the air passages. More massive and much more dangerous infection may take place when the patient is too weak or careless to restrain his cough and the expired air contains moisture to which numerous tubercle bacilli adhere. Another proved mode of spread of the disease, especially in children, is milk from cows with tuberculous udders, and to this is attributable the extreme frequency of abdominal consumption in young children, caused by the bovine type of the bacillus. The flesh and internal organs of such animals slaughtered provide another means of entry when consumed. We see then that infection may be air-borne, or food-borne; there is another though much less common channel of entry, through wounds in the skin.

The symptoms of consumption cannot be fully discussed in the present article. As seen in advanced cases, they are pretty generally appreciated by the non-professional eye; but at first they are treacherous, and frequently remain undetected. The early symptoms vary much. There may be nothing but a gradual loss of strength, it may be of flesh; there may be a slight discharge of blood from the throat or chest; there may be a more or less persistent, tickling cough; there may be breathlessness, with or without pain in the chest; or there may be little save an increased tendency to take cold easily, with but tardy power of throwing it off. Or, again, the slow beginnings may be expressed by a gradually progressing pallor, and, in the female, by diminution or cessation of the menstrual discharge. Any of those conditions, especially when they show themselves in the adolescent or young adult, are to be viewed with suspicion, and regarded as a sure indication that medical help is necessary. The more experience physicians have in the treatment of consumption, the stronger becomes

the conviction that many lives might be saved if only an opportunity were afforded of arresting the disease at an early stage. It is peculiarly at this point that the greatest skill and prudence are required from the physician. The appreciation of the signs which indicate the presence of consumption, both at this early stage and later, must be left in his hands, and cannot, of course, be treated of here. The later symptoms of consumption are better defined, and are, unhappily, too well known. They are, more particularly, cough, expectoration of a more or less thick, opaque substance, of varying colour, from whitish-gray to green, sometimes of blood, shortness of breath, pain in the chest, gradually advancing emaciation and loss of weight and strength, profuse sweating, especially in sleep, feverishness, diarrhœa. As the disease advances further there frequently occur swelling of the feet and sores about the mouth. Accompanying these symptoms, grave changes occur within the lungs. These are appreciated with ease by the trained observer. It should be added that all the above-mentioned symptoms must not be looked for in every case of consumption. The type varies endlessly, and some cases run towards a fatal issue with relatively few signs or symptoms, while anatomically the disease is the same. Consumption is generally a long-standing chronic disease, and it may be many years before the fatal termination ensues; but, on the other hand, there are cases which run a very brief course, with rapid destruction of the lung and symptoms of acute disease. This condition is popularly known as Galloping Consumption.

Curability of Consumption.—Until comparatively recently, a diagnosis of consumption was invariably regarded as a death warrant, and patients were treated on hothouse-plant principles while awaiting the fatal issue. Now opinion has swung round to the opposite extreme, and the public are apt to regard all cases of the disease as curable, while the patient himself cherishes the idea of recovery (*spes phthisica*) even to the penultimate stages of his malady. That consumption is an eminently curable disease is now generally accepted, and cases in an early stage treated on sound lines have every chance of recovery, while in a certain number of more advanced cases an arrest of the disease occurs, and in all cases life may be considerably prolonged and symptoms ameliorated.

Since about 1890, both medical and public interest in consumption have become much more vital and better informed. Hitherto it had been regarded as a problem which admitted of no solution save the fatal termination, and public health authorities were apathetic and inert. It may be justly asserted that the awakening of the public conscience to the possibility of taking practical action against the ravages of tuberculosis, and the origin of the modern anti-tuberculosis campaign, date from the founding of the Victoria Dispensary for Consumption, at Edinburgh in 1887, by Sir Robert Philip. This was the first unit in what is now known as the Edinburgh Anti-Tuberculosis System; it was designed not only to treat patients, but to educate them in hygienic methods of living and in preventing the spread of the disease. This voluntary educative work ultimately led to the voluntary notification of tuberculosis in 1909, and since that year the public health authorities have taken a very active part in all anti-tuberculosis measures. The information gained through the tuberculosis dispensary regarding the prevalence of consumption and its important relation to inadequate and insanitary housing conditions was instrumental in causing the public health authorities to adopt first voluntary and later (1912) compulsory notification of all cases of consumption. This showed where, and under what conditions, consumption was most frequently found, and provided a starting-point for more vigorous public-health action.

The treatment of consumption is one of the most complicated problems which the physician has to face. In its wide sense, it involves a consideration of some of the largest questions relating to social and individual hygiene. From the prophylactic point of view, it includes the study of all points bearing on the causation of consumption. Only thus can the attempt be made to cope effectively with the evil on the large scale. A knowledge of the dependence of consumption on overcrowding, vitiated air, improper ventilation, and other insanitary conditions has led the responsible authorities to adopt and enforce regulations to remedy the evil. Within recent years much has doubtless been effected in this direction. The legislature has taken in hand several departments of this work; and employers, in many instances, have shown a proper interest in the welfare of their employees. But more remains to be done. There is need of increased popular instruction, so that working-people and others may themselves appreciate the dangers which they run by neglect of simple precautions. The danger of phthisical expectoration as a means of transmission has been already alluded to. Such sputum should therefore, whenever possible, be destroyed by burning, or rendered innocuous by scalding or other satisfactory method. Indiscriminate spitting in public places should be forbidden. The value of spitting-flasks as a means of lessening the risk of infection should be impressed upon consumptive patients with expectoration.

Treatment.—In consumption, perhaps more than any other disease, preventive treatment is of paramount importance. Public health measures in the direction of notification, segregation of advanced cases, sanitary housing, provision of open spaces, all play a very important part in raising the general health of the community and thus increasing the individual's resistance to consumption. But individual preventive treatment can do more, especially where there is a family predisposition, or exposure to infection exists. All measures tending to place the body in as fit a state as possible should be encouraged. Chief among these is abundant fresh air, both in living and sleeping rooms by day and night; regular hours of sleep, sufficient nutritious food, and suitable clothing are also of prime importance. Exercise should be regular and systematic; cold baths followed by brisk friction of the skin all aid in giving that tone to the body which is its best protection against infection. If, despite such measures, symptoms of consumption appear and persist, no time should be lost in seeking medical advice.

When a definite diagnosis of consumption has been made, treatment, based on *defensive* and *offensive* methods, should be adopted. In carrying out the *former*, an attempt must be made to improve the general condition, so that effective resistance may be offered to the invasion of the bacillus. What is chiefly needed is a readjustment of the patient's life on physiological lines. This includes: (1) *Access to fresh air and sunlight.* There should be the fullest exposure to the influence of fresh air. During the day the patient should rest outside on a couch or reclining-chair. If he have to be indoors, he should be similarly resting close to the widely open window. By night he should be placed in proximity to the open window. The arrangement must be maintained more or less completely in all weathers. The patient comes quickly to value, and indeed enjoy, the treatment. Bodily warmth is readily

maintained by means of woollen clothing and wraps. In many cases complete rest is desirable at first. (2) *Regulated activity.* With advancing improvement, measured activity in the open air is permitted. The amount, which should be carefully regulated by the physician, will depend on the patient's state from time to time. It is gauged chiefly by his temperature and circulation. Fatigue must be scrupulously avoided. (3) *Suitable dietary.* An extra full dietary is needful. Under the older system of residence in warm rooms this was not easily managed. If the other conditions (1) and (2) have been attended to, appetite returns wonderfully. Digestive disabilities disappear. It is commonly best to have three good meals a day—at two of which meat should be given. Milk should be drunk freely at meal-times. Butter, cream, cheese, cod-liver oil, glycerine are all serviceable. The details of the dietary depend on the patient's state. (4) *Skin hygiene.* Over-clothing must be avoided. The dress should be warm, but light and loose; chest protectors and rolls of wadding are vicious. The skin should be treated in more delicate patients by daily sponging, and in stronger patients by actual bathing. The bath should be short, and followed by dry rubbing. The results obtained by such treatment are remarkable. The patient's appearance, appetite, digestion, weight, circulation, and temperature improve, and the symptoms of disease lessen, and in many cases disappear entirely.

These measures may be carried out anywhere under competent medical advice. They are carried out still more effectively in a sanatorium, where the patient may be taken more thoroughly in hand and taught how to arrange his life on physiological lines. In the selection of a sanatorium, it is the experience of the physician and the thoroughness of régime, rather than the loudness of advertisement, which should be looked to. A small sanatorium is frequently to be preferred to the larger institutions.

Climate.—Exaggerated value has been placed upon the benefit to be gained by residence in certain climates. Except from the point of view that in many cases a change of air may give a decided impetus to improvement, it cannot be said that any climate has proved to be curative in itself, and the medical view now generally held is that a patient should be treated as near his own home as is consistent with obtaining suitable conditions, since on recovery he will likely have to reside and work in that locality. It cannot be denied that many patients do extremely well in high altitudes, e.g. Switzerland (Davos, Montana, Arosa), California, the uplands of South Africa. Dry, warm climates, as in Egypt, and sea voyages have also their advocates. In all instances the opinion of an experienced medical man, with special knowledge of consumption, should be taken before undergoing the fatigue and expense of foreign treatment. Advanced cases should never be encouraged to make long and exhausting journeys, which can only end in disappointment.

Offensive treatment has been based largely upon the supposition that certain drugs inimicable to the tubercle bacillus in the laboratory would be equally so if introduced into the system. This may hold true, if there were any means of bringing such drugs into contact with the organisms in sufficient strength without injuring the tissues. Different methods have been tried; the wearing of respirators impregnated with creasote, terebene, menthol, &c., was at one time a popular expedient, but has fallen into disuse, partly because of the mechanical impediment offered by such apparatus to free breathing, and also to the serious doubt of any appreciable quantity of the antiseptic reaching the diseased portions of the lungs. For the latter reason also, the administration of such drugs by the mouth, by injections into the trachea, or the veins, has been largely dropped. Within the last few years, however, there has been a revival of the intra-venous method, especially in Denmark, where injections of *sanocrysin* (a solution containing gold) has been used, and this has been favourably reported upon. The method has been fairly extensively tried in this country with much less encouraging results, and as there are very considerable risks in applying it, it is not likely to be persisted with.

The most hopeful line of treatment so far lies in the use of *tuberculin.* There are many forms of this, but all have a common origin, viz. they are extracts of the bacilli, grown on artificial media, with the soluble products of the bacilli. In some tuberculins the bacilli are pulverised, and in others they are employed in suspension. They are injected subcutaneously in very dilute solutions, or administered in the form of an ointment rubbed into the skin. Tuberculin is a potent drug and has to be employed with great care, and in carefully selected cases. In a considerable proportion of such cases the results are entirely satisfactory, but in many others it has no beneficial effect, and may even be harmful if persisted in. Tuberculin is also of value in the diagnosis of tuberculosis when there is doubt as to its presence, and is employed for this purpose both in human beings and in cattle.

For a number of years Professor Calmette of Paris has used a weak tuberculin (B.C.G.), prepared from an a-virulent strain of tubercle bacillus, to inoculate infants a few days after birth. The object aimed at is to immunise the child before there is any possibility of infection; a large number of infants have been so treated, and Calmette reports most favourably upon the method, but it is too early yet for a decided opinion to be formed as to its effect in lessening the danger of infection. In any case one would expect considerable opposition to its use in this country. It cannot yet be claimed that any form of tuberculin provides a specific cure for consumption, though whether its failure is due to its preparation or to the method of application is uncertain. It however offers the most hopeful line of treatment yet known, and many observers are carrying out research in this direction. Each case of consumption provides its own individual problem, and calls for all the resource of the physician.

Consumption of the Lower Animals.—Consumption in domesticated animals is not uncommon, and is most prevalent among cattle. It is due to a distinct type of the tubercle bacillus, which is called the bovine type. The symptoms of the disease and the pathological changes in the different organs show marked similarity to those met with in the human form of the disease. The fact that consumption in cattle can be readily diagnosed by subcutaneous injection of tuberculin has led to its extensive use by veterinary surgeons, and one of the most hopeful directions of anti-tuberculosis effort has taken the form of the creation of tuberculin tested herds of cattle, which provide a tubercle-free milk. Horses and dogs are rarely affected, but pigs and poultry are very susceptible.

Tuberose (*Polianthes*), a genus of plants of the family Amaryllidaceæ, having a funnel-shaped perianth, with six-parted limb, stamens inserted in the tube of the corolla, a superior capsule, and flat seeds. The Common Tuberose (*P. tuberosa*) has rounded bulbous roots; a cylindrical, upright, unbranched stem, 3 or 4 feet high; both root-leaves and stem-leaves sword-shaped, and very acute; flowers spiked and somewhat aggregated, large,

pure white, the tube a little in-curved. The plant grows well in the south of Europe, but only bears the open air in more northern climates during summer. The roots are a considerable article of export from the south to the north of Europe. The plant is in high esteem for the beauty and fragrance of its flowers, the odour of which is most powerful after sunset, and has been known to cause headache and asphyxia in a room. The fading flowers emit, in certain states of the atmosphere, an electric light and sparks. The flowers yield an essential oil, which is used by perfumers. The native country of the tuberose is Mexico. The tuberose has been known in Europe for about three centuries. There are double and single flowered forms in cultivation, the former being the more highly esteemed. They are very extensively grown by British and American florists, who, by planting the roots successionally, manage to keep up a supply of flowers at all seasons. Of the double-flowered form there are several varieties, known in commerce as the Double African, the Double American, the Double Italian, and the Pearl. The last named, being less in stature than the others, is preferred.

Double Tuberose (*Polianthus tuberosa*).

Tubes. See PIPES.

Tübingen, an important town of Württemberg (Schwarzwald), 20 miles SW. of Stuttgart, stands on a ridge between the Neckar and the Ammer, in a beautiful and fertile district. Tübingen is an old place, irregularly built, with steep and narrow streets in the main; but the suburbs, especially round about the new university buildings and the railway station, have wide and spacious streets. Book-printing, bookselling, making of chemicals and surgical and physical instruments, milling, dyeing, and trading in field-produce, wine, hops, and fruits form the principal sources of employment, besides education. Tübingen has three Protestant churches (one, the Stiftskirche, dating from 1469–83, and containing the graves of twelve princes of Württemberg) and one Catholic church. Its university, founded in 1477 by Eberhard im Bart, afterwards first Duke of Württemberg, soon became a distinguished seat of learning, enjoyed for a time the presence of Reuchlin and Melanchthon, and continued to flourish long after the Reformation had firmly established itself. The Thirty Years' War, however, fatally checked its prosperity; and it was not till the early part of the 19th century that it began to reacquire a reputation. Under Baur (q.v.) it became celebrated as headquarters of the historico-philosophical theology known as the 'Tübingen School,' which has profoundly influenced the study of church history. Its medical faculty is of late distinguished. The university library is located in Duke Ulrich's *Schloss*, on the hill above the town, dating from 1535. Connected with the university are an anatomical and physical institute, a botanical garden, a chemical laboratory, &c. There is a Protestant seminary and a Catholic one, in which university lectures are given and theological students reside. Uhland long lived here. Pop. (1880) 11,708; (1900) 15,338; (1925) 21,207.

Tubuai. See AUSTRAL ISLANDS.

Tuckahoe, or INDIAN BREAD (*Pachyma Cocos*), an underground fungus growing as a saprophyte on the roots of the trees in the southern United States. It is edible, but tasteless.

Tucker, ABRAHAM, was born in London, September 2, 1705, studied at Merton College, Oxford, and entered the Inner Temple, but being rich and unambitious settled down to the quiet domestic happiness of the country gentleman's life, on the estate of Betchworth near Dorking, which he bought in 1727. He died November 20, 1774. All his life long a student of ethical questions, he began about 1756 the preparation of his great work, *The Light of Nature Pursued* (1768–78). Of its seven volumes only three were published in his lifetime, under the name of 'Edward Search, Esq.' Not a regular systematic treatise, but a series of disquisitions on metaphysics, theology, morals, it shows originality, ingenuity of illustration, and solidity of understanding. The standard edition is that edited, with a life, by the author's grandson, Sir Henry Mildmay (1805).

Tucson, capital of Pima county, Arizona, on the Santa Cruz River, 978 miles by rail SE. of San Francisco, with a university and some trade in wool, hides, stock, and gold. Founded by the Jesuits in 1560, it was the capital of Arizona from 1867 to 1877. Pop. 20,000.

Tucum, a fibre got from the bark of several Brazilian palms, *Astrocaryum Tucuma, A. Ayri,* and *A. vulgare.* It is woolly, extremely fine, but very strong.

Tucumán, a north-central province of the Argentine Republic, with an area of 10,422 sq. m. and a pop. of 400,000. It enjoys a delightful climate, and in the east is very fertile; in the west the country rises to the picturesque Sierra de Aconquija. By far the most important industry is sugar, of which the province produces some 300,000 tons annually. About 80 per cent. of the acreage and capital devoted to sugar in Argentina is located here. The Córdoba and Rosario Railway affords good communications.—The capital, Tucumán, on the Río Sil, 3 miles from the mountains and 723 miles by rail NW. of Buenos Aires, contains some handsome public and private buildings, a normal school, and several saw and flour mills and breweries. In the neighbourhood are orange-groves, sugar-plantations, and distilleries. The town is the seat of a university, which was founded in 1912. The climate is hot and somewhat unhealthy, owing to the marshes which cause the dreaded fever (*chucho*). Tucumán was founded in 1564; and here in 1812 Belgrano defeated the Spanish forces, and in 1816 a congress of deputies from the various provinces proclaimed the independence of the La Plata states. Pop. 100,000.

Tudela, a city in the Spanish province of Navarre, on the left bank of the Ebro, which is here crossed by a bridge of seventeen arches, 46 miles by rail NW. of Saragossa. Tudela is the seat of a bishop, has a Romanesque cathedral, and manufactures of woollens, silk, soap, earthenware. Pop. 10,000. It was the birthplace of the great traveller, Benjamin of Tudela (q.v.).

Tudor, the surname of a family of Welsh extraction which occupied the throne of England from 1485 to 1603. In the Welsh language Tewdr is the equivalent of Theodore. Owen Tudor (died 1461), the first of the race conspicuous in history, claimed descent from Cadwallader, and was certainly of very ancient family. He fought at Agincourt, became squire to Henry V. and Henry VI. His dancing at some court pageant is said to have first ingratiated him with Catharine of Valois, widow of Henry V., who appointed him to the office of Clerk of the Household, and before long entered

into either an illicit connection or a private marriage with him. The indignation of the public at this step obliged the queen to take refuge in a convent at Bermondsey, where she died (1437); and Tudor was sent to Newgate, but succeeded in escaping, and in obtaining two audiences of the young king, Henry VI., who afforded him protection and conferred on him the lieutenancy of Denbigh. He fought for the Lancastrians in the Wars of the Roses, was taken prisoner at Mortimer's Cross, and beheaded. Two sons had been born to him by the queen. On the elder, Edmond, the king bestowed the earldom of Richmond, and on the younger, Jasper, the earldom of Pembroke. The Earl of Richmond married Margaret, daughter and heiress of John Beaufort, Earl of Somerset, whose father was an illegitimate son of John of Gaunt; and his son ascended the throne of England as Henry VII. (q.v.).

See also the articles on Henry VIII., Mary, Elizabeth, Edward VI.; and A. D. Innes, *Ten Tudor Statesmen*, and *England under the Tudors* (1906).

Tudor Style, in Architecture, a rather indefinite term applied to the Late Perpendicular (q.v.), and the transition from that to Elizabethan (q.v.). See also FAN-TRACERY.

Tuesday. See TYR.

Tuff, or VOLCANIC TUFF, in Geology, the name given to the comminuted rock-debris ejected from a volcanic orifice. The term is usually restricted to the finer kinds of volcanic detritus, or to fragmental igneous rocks in which such fine-grained materials predominate. Thus some tuffs may be described as masses of finely comminuted debris through which are scattered, more or less abundantly, lapilli and angular or subangular blocks of volcanic or other rocks. Other tuffs may consist wholly of very fine-grained materials or of the most impalpable volcanic dust. Most tuffs, whether deposited on a land-surface or accumulated under water, are stratified. Subaqueous tuffs shade off gradually into ordinary aqueous rocks. Thus we have *tuffaceous sandstones* and *tuffaceous shales*, made up of mixtures of volcanic detritus and the ordinary products of aqueous erosion; and many of these rocks are fossiliferous. Subaërial tuffs, likewise, not infrequently contain relics of land plants and animals. Many varieties of tuff are known by special names. Thus *trachyte-tuffs*, *basalt-tuffs*, &c. are rocks composed essentially of the debris of *trachyte*, or of *basalt*, &c. *Pumice-tuff* consists mainly of pumiceous materials —*Trass* being the name given to a variety of pumice-tuff met with in the Eifel. *Peperino* is an earthy granular tuff, containing abundant crystals of various volcanic minerals, which is well developed in the Alban Hills near Rome. *Palagonite-tuff* is fine-grained, consisting of hydrated fragments of sideromelan, a variety of basalt glass.

Tugela, a river of Natal (q.v.) forming part of the northern frontier and running SE. into the Indian Ocean. In the Transvaal war Buller was defeated in an attempt to cross at Colenso on 15th December 1899; crossed twice, but had twice to recross (Spion Kop, Vaal Krantz); and was only finally successful in forcing the passage on 22d February 1900, so as to push on to the relief of Ladysmith (28th).

Tugendbund ('league of virtue'), a Prussian patriotic union founded at Königsberg in 1808, ostensibly for the promotion of social and other reforms, actually aimed at throwing off the French yoke; it was dissolved under pressure from Napoleon in 1809.

Tuggurt. See TOUGGOURT.

Tughina, BENDERY, or BENDER, a strongly fortified town in Bessarabia, on the Dniester, 82 miles NW. of Odessa; pop. 36,400, including many Armenians, Tatars, Moldavians, and Jews. In 1770 the Russians captured the place, which was restored to the Turks in 1774, but was again stormed by the Russians in 1789, 1806, and 1811. In 1812, with Bessarabia, the town was ceded to Russia, and in 1918 became Rumanian. In 1709–12 Charles XII. of Sweden lived at Varnitza, near Tughina.

Tuileries, PALACE OF THE, built on the site of an ancient pleasure-house called the *Hôtel des Tuileries*, on account of its being built in a locality outside the city where there were several tile-works (*tuileries*). Francis I. bought this property from the Sieur de Villeroy, as a present to his mother, the Duchess of Angoulême. It was afterwards chosen by Catharine de' Medici as the site of a new palace instead of that of Tournelles, and the building was begun in 1564. The palace was burned by the Commune in 1871, and all that remained, save two wings leading to the Louvre, finally removed in 1883. Gardens now occupy most of the site. See PARIS, p. 762.

Tuke, a family of Yorkshire Quakers, well-known as early tea-merchants, but—especially William (1732–1822)—chiefly remembered for their work in connection with the improvement they effected in lunatic management in England.

Tula, an ancient and important manufacturing town of central Russia, capital of a government on the Upa, an affluent of the Oka, 110 miles S. of Moscow by rail. Its churches, its arsenal, museum, and government offices, and the ancient Kreml are the principal buildings. The principal industries are in iron and steel goods, especially the firearms of the great government gun-factory. Cutlery, locks, *samovars* or tea-urns, mathematical instruments, harmoniums, and bells are made; the Niello-work (q.v.) of Tula is famous; and dyeing, soapmaking, &c. occupy many of the 123,000 inhabitants.

Tulare Lake. See CALIFORNIA.

Tulcea, a Rumanian port in the Dobrudja, just where the Danube divides into its three main branches. There is a trade in grain and fish. Pop. 24,000.

Tulchan Bishops, a term of contempt given to the titular bishops in Scotland, who in 1572 agreed to hold office, letting all the revenues of their charge, except a miserable pittance, be absorbed by the nobles as lay patrons. 'Tulchan' was a calf's skin stuffed with straw, used to induce a cow to give her milk freely.

Tuldja. See TULCEA.

Tulip (*Tulipa*), a genus of plants of the family Liliaceæ, having an inferior bell-shaped perianth, of six distinct segments, without nectaries, a sessile three-lobed stigma, a three-cornered capsule, and flat seeds. The bulb is fleshy and covered with a brown skin. The tulips are mostly natives of the warmer parts of Asia. The name is derived through French and Italian from the Turkish *tulbend*, Persian *dulband*, originally a Hindustani word, 'a turban.' The Garden Tulip (*T. Gesneriana*) is a collective species, consisting of plants whose wild ancestors cannot be traced. Apparently a native of the Levant, it was seen at Augsburg by Conrad Gesner in 1559, and rapidly spread throughout all parts of Europe. It is from 18 inches to 2 feet high, with a smooth stem, bearing one erect, large flower; the leaves ovate-lanceolate, glaucous, and smooth. The varieties in cultivation are innumerable. The tulip mania of the 17th century in Holland was the most remarkable of its kind that has ever occurred in horticultural or perhaps any

other kind of commerce. The tulip is still most sedulously cultivated in Holland, especially at Haarlem, whence bulbs are largely exported; but attention is almost exclusively devoted to the cheaper varieties, which are used in hundreds or thousands for the purposes of decoration in gardens and rooms throughout winter and spring. The purely florists' varieties, which gave rise to the tulip mania, are not suited for this purpose. Tulips succeed best in a light, dry, and somewhat sandy soil. Bulbs are planted in the end of October, or beginning of November, and the flowers are produced early in summer. Beds of choice tulips are protected in spring by hoops and mats; and in the flowering season an awning of thin canvas is spread over them, which greatly prolongs the duration of their beauty, as they are soon spoiled by exposure to strong sunshine. Tulips are propagated by offset bulbs, and new varieties are raised from seed. Another species of tulip cultivated in gardens is the Sweet-scented Tulip, or Van Thol Tulip (*T. suaveolens*), which has yellow or red flowers, inferior to those of the common garden tulip in beauty, but prized for their fragrance, and for appearing earlier in the season. It is often cultivated in pots in windows. It is a native of the south of Russia. The Wild Tulip (*T. sylvestris*), a native of Greece and Sicily, is common in the woods and vineyards of Germany and the south of Europe, and has been found as an escape in England. It has a slender stem, narrow lanceolate leaves, and a somewhat drooping, fragrant, yellow flower. It develops offset bulbs at the end of fibres thrown out from the root, at some distance from the parent plant. Its bulbs are eaten in Siberia, although bitterness and acridity characterise all the bulbs of this genus. See Jacob, *Tulips* (1912).

Tulip Tree. See LIRIODENDRON.

Tull, JETHRO (1674–1741), a great agricultural reformer and author, was the son of a Berkshire landlord, and in Berkshire invented a drill, introduced a method of pulverising the soil, and wrote, in *Horse-hoeing Husbandry*, 'on the principles of tillage' in 1733. He had to face an incredible amount of opposition and vituperation at the hands of labourers, farmers, and authors; but his work was ere long recognised as epoch-making.

Tullamore, chief town of King's County in Ireland, is on the Grand Canal, 59 miles WSW. of Dublin; pop. 5000.

Tulle, capital of the French dept. of Corrèze, at the confluence of Solane and Corrèze, 61 miles ENE. of Périgueux, and the seat of a bishop (since 1317). Small-arms and perfumery are manufactured; the thin open silk or cotton network fabric called *tulle* is no longer made here, but mostly at Sankt Gallen and other Swiss towns. Pop. 15,000.

Tulloch, JOHN, an eminent Scottish divine, was born at Bridge of Earn, in Perthshire, June 1, 1823, studied at St Andrews and Edinburgh, and was licensed to preach in 1844. Next year he accepted the charge of St Paul's at Dundee, in 1849 was presented to Kettins in Forfarshire, and was appointed in 1854 principal and primarius professor of Divinity in St Mary's College, St Andrews. Appointed in 1859 one of the Queen's chaplains, he became senior principal at St Andrews in 1860, deputy-clerk of the General Assembly in 1862, Clerk in 1875, and Moderator in 1878, and died at Torquay, February 13, 1886. From an early age he contributed to the magazines—*North British Review*, *British Quarterly*, and later the *Contemporary Review* and *Fraser's Magazine*, of which last he was for some time editor. His first book was the second Burnett prize essay on *Theism* (1855), and this was followed by *Leaders of the Reformation* (1859), *English Protestants and their Leaders* (1861), *Beginning Life* (addressed to young men, 1862), *The Christ of the Gospels and of Modern Criticism*—an answer to Renan (1864), *Rational Theology and Christian Philosophy in the Seventeenth Century*—altogether an admirable work, discussing with equal sympathy and insight the Falkland group and the Christian Platonists (2 vols. 1872), *Facts of Religion and Life* (sermons, 1876), *Pascal* in Blackwood's 'Foreign Classics' (1876), *The Christian Doctrine of Sin*—the Croall Lectures at Edinburgh (1877), *Modern Theories in Philosophy and Religion* (1884), and *Movements of Religious Thought in Britain during the Nineteenth Century* (1885). Tulloch was a fearless Liberal alike in politics and theology. His conception of an Established Church involved the idea of a comprehensiveness and tolerance unusual to Presbyterian theology, and he laboured throughout life to lay down the sure foundations on which a rational yet reverent Christianity might be firmly built, which should be distinguished by its inwardness and spiritual elevation rather than by the rigidity of its definitions. His strong and earnest religious convictions, large-hearted benevolence, catholic sympathy and broad culture, noble presence and impressive oratory made him conspicuous. See Memoir by Mrs Oliphant (1888).

Tulsa, capital of Tulsa county, Oklahoma, on the Arkansas River, 14 miles NE. of Sapulpa. It is in the centre of a rich agricultural and mineral country. Huge quantities of oil are produced, and have been the cause of the rapid growth of population. There are some manufactures, and a university is located here. Pop. (1900) 1390; (1910) 18,182; (1920) 72,075.

Tulsí Dás (1532–1623), the greatest of the Hindí poets, whose principal achievement was the rehandling of the Sanskrit epic *Râmâyaṇa*. See INDIA, p. 102.

Tumbarumba, on the upper Murray River, in New South Wales, site of a great dam begun in 1919.

Tumble-weed, a name given to several plants, chiefly Chenopodiaceæ, Amarantaceæ, and Cruciferæ, introduced from the plains of southern Russia and tropical and temperate America into the agricultural districts of many countries, where they often prove absolutely pernicious. In autumn their dry stems break off just above the ground, and the least wind will then send the plant, full of ripe seeds, whirling over the ground, often getting entangled with other plants of the same nature and forming thus rolling masses of immense size. Corispermum (Bug-weed), Cycloloma (Winged Pigweed), *Salsola Kali* (Russian Thistle), *Sisymbrium altissimum* (Tumble Mustard), *Amarantus albus* (Tumble weed par excellence), are but a few of these unwelcome visitors.

Tummel. See RANNOCH.

Tumour (Lat. *tumor*, 'a swelling') is the term applied in medicine to new formations characterised generally by their 'independent growth and almost independent life, so little do they appear to concern themselves with the interest of the body as a whole;' 'their tendency to continuous growth;' and 'the tenacity with which they maintain their hold upon the individual, rarely disappearing or even diminishing in size.' They are thus separated on the one hand from simple hypertrophy of organs normally present, and on the other from inflammatory swellings, and the enlargements associated with syphilis, tubercle, glanders, &c. Many cysts, however, though grouped with tumours, are merely enlargements of normal cavities (see CYST).

The most important division of tumours is that into *innocent* or *benign* and *malignant* tumours. The malignant tumours tend (1) to grow continu-

ously into the tissues surrounding them, irrespective of the natural boundary lines between different structures; (2) to recur after removal; (3) to cause secondary growths of the same nature in the neighbouring lymphatic glands, (4) and in distant parts of the body. Malignant tumours of different structures and in different organs possess these characters in varying degrees, and may not manifest them all; but if malignant at all they are dangerous, and certain sooner or later, if unchecked, to destroy life. Innocent tumours, on the other hand, are sharply marked off from the surrounding tissues, tend to grow by pushing aside, rather than by invading adjacent structures, do not return after removal, and do not lead to the occurrence of similar growths in other parts, though several or even many of them may be present in the same patient. They may cause death by interfering, on account of their situation, with the function of important organs, by becoming the seat of ulceration and hæmorrhage, &c.; but they have not the intrinsic dangers of the other group.

With regard to the causes of tumours little is known. In some cases they can be traced to the effects of injury or of long-continued irritation of a part, though the reason why they should so arise in a particular individual is often inexplicable; in some cases heredity seems to be an important factor in their occurrence. But 'in the large majority of cases they are formed without any apparent cause.' The organs most frequently affected are the womb and the female breast; hence they are on the whole more common in the female sex. But some organs common to both sexes are affected almost exclusively in males (e.g. the lip by cancer).

With regard to treatment, simple tumours demand removal, generally speaking, only when they give rise to discomfort or disfigurement; malignant tumours should be removed at the earliest possible moment. With few exceptions a cutting operation passing wide of the tumour is the only method for complete removal of the latter.

The solid simple tumours resemble more or less closely the fully developed structures of the body, generally of the part in which they grow, and are classified accordingly. The most important groups are the fatty tumours (lipoma), the most frequent of all; the fibrous (fibroma); the cartilaginous (enchondroma); the bony (exostosis); the vascular (Nævus, q.v.); the warty (papilloma); and the glandular (adenoma). The malignant tumours are either aberrant developments of epithelium (carcinoma; see CANCER), or resemble imperfectly developed connective tissues (see SARCOMA).

Tumult. See RIOT.

Tumulus. See BURIAL, BARROW, CAIRN.

Tun, an obsolete liquid measure of capacity; in old ale and beer measure, 216 gallons; in old wine measure, 252 gallons. As a tun of water weighs a little more than 2000 lb., probably the ton weight (see TON) was taken from the tun measure.

Tuna. See TUNNY.

Tunbridge. See TONBRIDGE.

Tunbridge Wells, a charming inland watering-place of Kent, on the border of Sussex, 5 miles S. of Tonbridge and 34½ SSE. of London. It occupies the head and slopes of one of the valleys of the Weald, and has in general a south-west aspect, commanding very fine views. The chalybeate waters, situated at the end of a parade called the 'Pantiles,' were discovered by Lord North in 1606, and patronised in 1630 by Henrietta Maria. Puritans also resorted hither, and to them the place owes such names as Mounts Ephraim and Sion; whilst among later visitors have been Catharine of Braganza, Evelyn, Queen Anne, 'Beau' Nash, Richard Cumberland, Dr Johnson, Richardson, Garrick, Chatham, and Queen Victoria. There are a breezy common, a church (1685) long said to be in two counties and three parishes, a public hall (1870), a pump-room (1877), a friendly societies' hall (1878), and a considerable trade in 'Tunbridge ware' (see TONBRIDGE). The season lasts from July to September. Tunbridge Wells was incorporated as a municipal borough in 1889. Pop. (1851) 10,587; of extended area (1921) 35,568.

Tundra, the vast plains which border on the Arctic Ocean. See DESERT, SIBERIA.

Tung-oil, or WOOD-OIL, got from the nuts of various species of Aleurites (*A. Fordii*, *A. cordata*, *A. montana*) in China, Japan, and elsewhere, is used for varnishing, stiffening fabrics, waterproofing wood, and many other purposes. See VARNISH. For *A. moluccana* or *triloba* see CANDLENUT.

Tungsten (sym. W; atom. number 74; atom. wt. 184), a rare metal, chiefly derived from Wolfram (whence the symbol W), which is a tungstate of iron and manganese, and likewise found in Scheelite, which is a tungstate of calcium. The metal (Swed. *tung-sten*, 'heavy stone') is obtained either as a dark-gray powder or in heavy iron-gray bars, which are very hard and difficult of fusion, and have a specific gravity of 19·1. Aqua regia and nitric acid convert it into tungstic acid. Tungsten forms with oxygen a dioxide (WO_2), and an acid oxide (tungstic anhydride, WO_3). Various tungstates have been formed and examined. The tungstate of sodium serves as a means of preventing muslin, &c., from bursting out in a flame when brought in contact with fire. Wolfram metal and ferro-tungsten are now largely employed for filament electric lamps and to harden steel (see IRON AND STEEL), as in armour plates, gun-forgings and rifling, tungsten steel, fine tool steel, high-speed steel, and drill steel.

Tunguses, an ethnographic group of the Ural-Altaic family; see SIBERIA. The term Tungus is preferred by ethnologists for the human type more commonly called Mongol, with yellowish skin, coarse black straight hair (little on face or body), broad head, broad flat face, prominent cheek-bones, broad nostrils, and 'Mongol' (or 'Tungus') eyes.

Tun-huan or **Tung-hwang** (also known as 'Sha-chou,' 'city of sands'), a square-walled town in a prosperous oasis of the Chinese province of Kan-su, situated about 95° E. and 40° N. at the intersection of important trade-routes and an ancient Chinese wall. About 10 m. to the SE. is the famous 'Cave of the Thousand Buddhas,' which consists of over 500 temples and grottos cut out of and extending along a stretch of solid rock of about 1 mile in length. These caves (still resorted to for worship) are filled with Buddhist frescoes and statuary, while a great library, that had been walled up there some 900 years, was discovered (1906–8) by Sir Aurel Stein (q.v.). Many extremely valuable MSS. in Chinese, Sanskrit, Central-Asian Brahmi, Sogdian, Manichæan-Turkish, Uigur, Tibetan, &c., were found, also paintings on silk (dating from the T'ang dynasty), embroideries, tapestries, &c. A Chinese MS. (probably translated from Pahlavi) is a Manichæan treatise purporting to be addressed by Mani to Addas, one of his principal missionaries (see MANICHÆANS, and the books there cited). The MSS., mostly Buddhist literature, belong probably to the 9th and 10th centuries, when Tun-huan was under the domination of Tibet.

See *Ruins of Desert Cathay* (1914) and other works by Stein; Pelliot, *Les Grottes de Touen-houang* (1920).

Tunic (Lat. *tunica*), the Roman equivalent of the Greek *chitōn*, the chief under-garment of Greeks and Romans of both sexes. In its ordinary form it consisted of a plain woollen shirt, girded round the loins and reaching to about the knees, with two short sleeves covering the upper part of the arm. Over this loose outside draperies in various forms were worn, as the Greek *pallium* and the Roman *toga*. The women's tunics (Lat. *stola*) were usually longer and looser than those of men, and were fastened under the bosom instead of round the loins.

Tunicata, or UROCHORDATA, a class of remarkable animals, many of which are popularly known as Ascidians (q.v.) or sea-squirts. As is explained in the article on Ascidians, the Tunicates are now regarded as occupying a lowly place among vertebrate or chordate animals. This is proved by the characteristics of the larval forms, and also by three or four genera—e.g. Appendicularia (q.v.)—which retain throughout life the vertebrate characteristics which the great majority lose in the degeneracy of their adult life. The class includes three orders —(1) Larvacea, of which Appendicularia is type; (2) Ascidiacea, or Ascidians; and (3) Thaliacea, free-swimming forms— Salpa (q.v.) and Doliolum.

See W. A. Herdman, 'Tunicata,' *Challenger* Reports, vi. 1882; xiv. 1886, &c.

Tuning-fork, a contrivance for regulating the pitch of the voice or of a musical instrument. It consists of two prongs of steel springing from a handle, and so adjusted as to produce a fixed note when struck. Piano-tuners and choir-leaders require tuning-forks tuned to C, while violin and banjo-players require forks tuned to A and G respectively, on account of the original tuning of the strings. In full orchestras, the oboe gives A to the strings. There are forks which are capable of adjustment to different standards of Pitch (q.v.) by means of a movable brass slider fitted with a screw. Tuning-forks are much used in experiments on Sound (q.v.).

Tuning-pipes, with riveted reeds, are made frequently in sets for string players unable to tune without them; e.g. violin players would require a set tuned G, D, A, E.

Tunis, or TUNISIA (Fr. *Tunisie*), a French protectorate of North Africa, bounded on the N. and E. by the Mediterranean, on the SE. by Tripoli, on the SW. by the Sahara, on the W. by Algeria. The area has been estimated at about 48,300 sq. m. Numerous bays and arms of the sea indent the coast, and branches and spurs of the Atlas (q.v.) range with an extreme elevation of 6500 feet, penetrate the interior. The country, indeed, is mostly high ground, especially in the north and north-east, while the central region is occupied by a tableland; there are desert steppes, seldom visited by rain, in the south, and a belt of fertile land lies along the eastern coast. The south contains shallow salt-lakes (*shotts*), the largest being Shott Kebir (Shott el Jerid), but the only river of any importance is the Mejerda, 300 miles long, which rises in Algeria and flows into the sea at Porto Farina. The climate is pleasant during the spring and autumn at the coast, but hot during the summer, and very hot in the interior during most of the year. The winter is the rainy season. Winds are generally variable and frequent, especially in the summer. The flora of northern Tunis resembles that of southern Europe, and flowers, especially those from which perfumes are extracted, grow luxuriantly, while there are dense oak and cork-oak forests which are very valuable; in this respect southern Tunis belongs more to the Sahara (q.v.), and the southern part of the plateau is covered with esparto grass. Game—wild pigs, wild goats, gazelles and other antelopes, also hares, partridges, &c.—is fairly plentiful; hyenas and jackals are found, and most of the domesticated animals are kept.

According to the census of 1926 the population of Tunis was as follows:

French (excluding army of occupation)	71,020	
Italians	89,216	
Maltese	8,396	
Spaniards, Greeks, &c.	4,649	
		173,281
Arabs and Berbers	1,932,184	
Jews	54,243	
		1,986,427
		2,159,708

The European population has increased enormously since 1881, when there were less than 1000 French in the country. The Arab population dates from the great immigrations of the 7th and 8th centuries; and the Jewish population from those of the 15th and 16th centuries (chiefly from Spain and Portugal). The capital is Tunis, with population of 185,996, including 79,136 Europeans. Other towns are Sfax (27,723), Sousse or Susa (21,298), Bizerta (20,593), Kairouan or Kairwan (18,527). The Arabs are Mohammedans under the Sheik-ul-Islam, and speak Arabic, while the Europeans are mosly Roman Catholics under the Archbishop of Carthage, but the Greek Church has some adherents. There is a Mohammedan university in the capital, and throughout the country a large number of schools (public and private), some of which receive government grants.

The Bey of Tunis is the nominal ruler of the country, but actually the control is in the hands of a French Resident-General, who is responsible to the French Foreign Office. In 1922 a Grand Council was established (presided over by the Resident-General, who is also Minister for Foreign Affairs), consisting of eight French and three Tunisians. The governors of the 19 districts into which the country is divided are French, but natives fill the subordinate posts. There are French and Tunisian courts of justice, the latter dealing with cases in which solely natives are concerned. The French army of occupation consists of some 25,000 of all ranks. The financial position is favourable.

Agriculture is very important, the most fertile ground being found in the valleys in the north and north-west. Over 1½ million acres are sown with wheat, and over 1¼ million with barley, and oats are also grown. There are over 16 million olive-trees, mostly on the south-eastern littoral (known as the Sahel), and the cultivation of the vine is rapidly becoming very profitable, but fruits generally (oranges, lemons, &c.) and vegetables abound in the coast regions. Among the southern oases there are over 2 million date-palms. Good and abundant pasturage is found in the central tableland. Tunis is rich in minerals, especially phosphates; iron, lead, zinc, and marble are also found. Hot springs, some of which were utilised by the Romans, are scattered over the country, and are now used considerably for irrigation. Various native industries are carried on, such as the manufacture of carpets, rugs, leather, woollen fabrics, pottery, &c. The fisheries (especially tunny) are important. Trade is in a flourishing condition, though imports still exceed exports in value. The principal imports are textile goods (largely from Great Britain), colonial wares, machinery, and the principal exports cereals, minerals, metals, olive-oil. The bulk of the trade is done with France. There are over 1500 miles of railway, broad and narrow gauge, while the telegraph and road systems are both good.

Gafsa (Lat. *Capsa*) gives its name to the Upper Palæolithic Capsian culture, the parent of the Euro-

pean Aurignacian (see STONE AGE). Many important Roman antiquarian remains, including aqueducts that are still used, are to be found in Tunis. For the early history see CARTHAGE. In the 7th century A.D. the Arabs invaded Tunis; Mohammedanism, adopted by the Berbers, practically entirely superseded Christianity, and in 670 the sacred city of Kairouan was founded. Up to the 16th century the country was ruled successively by the dynasties of the Aghlabites, Fatimites, Almohades, and Hafsites. Important events in this period are the Norman occupation (from Sicily) of Sfax and Tripoli (1148–60) by Roger II. (q.v.); the invasion of Tunis by Louis IX. during the seventh Crusade, and his death there in 1270; the unsuccessful attack by the Duc de Bourbon in 1390. Threats of Turkish occupation led to the intervention in 1535 of Charles V., who released many thousands of Christian slaves, but in 1575 Sinan Pasha brought the country completely under the Ottoman power, giving it a new constitution. The government was invested in a Turkish pasha as governor, with a council composed of the principal officers of the Turkish troops and the commander of the Janizaries. But in a few years a military mutiny overturned matters, and a dey, with limited authority, was raised to power; the chief executive functions were retained by the council, a bey being put at the head of the revenue and taxation departments. By slow degrees this officer so extended his influence and authority that at last Murad Bey succeeded in making the office hereditary; his family governed Tunis for a century till 1702, enlarging their borders by conquests on land and greatly increasing their own and the country's opulence by piracy, directed against the Christian powers by sea (see BARBARY, CORSAIRS). St Vincent de Paul, for instance, was taken prisoner and sold into slavery at Tunis, while the destruction in 1655 of the piratical fleet in Porto Farina by Blake was an audacious and memorable act.

In 1702 the last of the deys absorbed the beyship, and in 1705 the present dynasty of beys, founded by Hussein ben Ali, a native of Crete, was established. In the 18th century, after a series of reverses, Tunis became tributary to Algeria, but at the beginning of the next century the country became again virtually independent, the Turkish suzerainty being merely nominal. Internal administration, however, was not satisfactory, and Britain, France, and Italy began to show a rivalry of interest in the country. In 1881 France invaded Tunis, under the pretext of chastising the Kroumir tribes which had been making incursions into Algeria; this invasion resulted in the signing of a treaty (1881, confirmed by convention 1883), placing the country practically under French protection, under which it has made excellent progress, though the protectorate was not at first established without some disturbance and bloodshed. This occupation is one of the most successful and important that France has undertaken; it gives her an important coast-line, the use of many and secure harbours, and makes her the mistress of North Africa, besides, to a certain degree, lessening the strategic importance of Gibraltar and Malta. During the latter part of the Great War, Tunisian troops were employed in France.

See Tissot, *Exploration scientifique de la Tunisie* (1884–88); Graham and Ashbee, *Travels in Tunisia* (with bibliography, 1887–90); Mercier, *Histoire de l'Afrique septentrionale* (1891); Playfair in Murray's *Handbook* (1895); the Government publication, *La Tunisie* (1896); Lapie, *Les Civilisations tunisiennes* (1897); Sir H. Johnston, *Colonisation of Africa* (1899); Gept, *La Tunisie économique* (1910); Fribourg, *L'Afrique latine* (1922); general works in Eng. by Broadley (1882), Vivian (1899), Douglas (1923); in Ger. by Hesse-Warteg (1882: trans. 1899), Schönfeld (1902); in Fr. by Faucon (1893), Besnier (1904), Loth (1907), Lanessan (1917), Saurin (1918). See also ALGERIA, CARTHAGE, FRANCE (p. 809), SAHARA, TRIPOLI.

TUNIS, the capital, is situated on rising ground on the inner side of a small lagoon (El Bahira) near the south-west extremity of the Bay of Tunis, an inlet of the Mediterranean Sea. The native and European sections of the town are kept quite separate. In the former, the streets are narrow, dirty, and sometimes unpaved, but the picturesque bazaars (*souks*) are well supplied with oriental goods, fruits, &c. There are about 50 mosques, many of them splendidly decorated, but entrance is forbidden to Christians. Some of the mosques have schools attached, and the Great Mosque has a university. The palace of the bey contains some admirable plaster work, tiles and other Moorish decorations, and the view from the roof is superb. The citadel, the old slave prison, is now used as barracks. The European town is well laid out, and contains the Roman Catholic cathedral, the Residency, the Municipal Theatre, Municipal Park, the School of Agriculture, &c. There are banks, hospitals, and various charitable and religious institutions. The port of Tunis, where harbour works have been constructed, is in direct communication with the sea at La Goulette (Goletta) by a canal 7 miles long, 93 feet wide, and 21 feet deep, dredged in the lagoon. Shipping and trade are important, and there are manufactures of cloth, olive oil, pottery, leather, &c. About two miles away is the Bardo, a former palace of the bey, containing the Alaoui museum, with a splendid collection of Punic, Libyan, Roman, and Arabian antiquities; there is also some fine decorative carving. Carthage (q.v.) is some 8 miles to the NE. of Tunis. The climate is on the whole pleasant, but the winds are apt to be unreliable. Pop. (1926) 185,996, including 27,922 French, and 44,076 Italians.

Tunis (anc. *Thines* or *Tounès*) is a more ancient town than Carthage, but was supplanted by it, and only regained its importance with the Arab domination (though at first Kairouan was considered the capital). The town was in the hands of the Spaniards 1535–74.

Tunkers (Ger. *tunken*, 'to dip'), DUNKERS, or DUNKARDS, a religious sect found chiefly in Pennsylvania, Maryland, Virginia, Ohio, Indiana, Illinois, Iowa, Missouri, Nebraska, and Kansas. In 1908, the corporate and official title was changed from 'German Baptist Brethren' to 'Church of the Brethren.' The sect had its birth in 1708 in Germany, being indeed a child of the Pietist movement of the 17th century; but between 1719 and 1729 all the members, harassed and persecuted at home, had, on Penn's old invitation, removed to Pennsylvania under the leadership of Alexander Mack (1679–1735) and Peter Becker; they settled about Germantown and Philadelphia, whence they gradually spread southward and westward. Shortly after arrival in America, a few under Conrad Beissel seceded and formed the sect of the Seventh Day Baptists. In their creed the Brethren are thoroughly evangelical and strictly orthodox. Baptism they administer by trine immersion (hence their name), and only to adults. Love-feasts are held in each congregation twice a year, preceded by washing of feet, and followed by the giving of the right hand of fellowship and the kiss of charity (women with women, and men with men), and then by the communion. Each congregation is independent, and elects its own deacons, ministers, and elders or bishops; the latter, who preside over the congregations, are chosen (generally by seniority) from among the ministers (who

are authorised to baptise, marry, and preach). Ministers are supported by the church if they are poor or are sent out as missionaries, but as a rule no salaries are paid. There is an annual conference to which each congregation and each district (or group of congregations) send delegates. Other customs of the sect that deserve notice are their plain and generally uniform dress, their avoidance of litigation, of war, and of any active share in politics; they take no oaths, and so may not join (or if converts remain members of) any secret society. The stories of their celibacy or discouragement of marriage are without foundation. They anoint the sick with oil, are total abstainers, and discourage the use of tobacco. Most of the Brethren are engaged in farming. In 1882 a serious split occurred in the sect, arising (amongst other things) from differences of opinion on the numerous educational and Sunday school activities which received a great impetus in the seventies, and on the missionary work, begun in 1876, which extended later to Scandinavia, France, Switzerland, India, China. The Progressives, or radicals, seeking to accommodate the old traditions and customs to new circumstances, and the Old Order, or ultra-conservatives, rejoicing in isolation and admitting of no change at all, broke away from the Conservatives or main body, which strove to pursue a middle course. The Conservatives now number some 60,000 communicants, the Progressives 8000, and the Old Order 4000. The two former have colleges, and produce various publications. The Progressives advocate administrative independence of each congregation from the decisions of the annual conference.

See Gillin, *The Dunkers* (1906), and Histories in Eng. by Brumbaugh (1899), Falkenstein (1901).

Tunnage and Poundage, certain duties on wine and other merchandise, which began to be levied in England in the reign of Edward II. They were at first granted to the crown by the vote of parliament for a limited number of years, and renewed on their expiry. The object of these imposts was said to be that the king might have ready money in case of a sudden emergency demanding it for the defence of the realm and the guarding of the sea. Originally fluctuating in amount, tunnage (less correctly *tonnage*) and poundage came to be fixed at 3s. on every tun of wine, and 5 per cent. on all goods imported. In the reign of Henry V. they were first conferred on the king for life; and the same course being followed with his successors, the sovereign began gradually to consider them as his proper right and inheritance, and the vote of parliament as but a formality expressive of the popular recognition of his prerogative. Though these duties were not voted to Henry VIII. until the sixth year of his reign, he, notwithstanding, levied them from the date of his accession. It was, in fact, usual to levy these duties during the period intervening between a sovereign's accession and his first parliament, and this was done by Charles I., as by his predecessors. The Commons, however, in Charles's first parliament accorded these imposts not for life, but for a year only; and the House of Lords objecting to this departure from previous usages, and rejecting the bill, it was attempted to levy tunnage and poundage by the royal authority alone, a proceeding which repeatedly roused the opposition of the Commons. Charles was in 1641 induced to renounce the power of levying these or any other imposts without parliamentary sanction. Charles II. and James II. obtained grants of tunnage and poundage for life, but William III. only for limited periods; and by three statutes of Anne and George I. these imposts were made perpetual, and mortgaged for the public debt. The Customs Consolidation Act in 1787 swept away tunnage and poundage, and similar charges, and substituted a new and single duty on each article. See CUSTOMS DUTIES.

Tunnel, an arched passage driven through an elevation, or mountain, or under a river, or at deep levels in cities for underground railways. They may be divided into land and subaqueous tunnels, and according to their purpose into railway or canal tunnels, tunnels for sewage, water-supply, &c. Tunnels have been in use from an early period in history, notable ancient ones being those under the Pyramids (q.v.), that for draining Lake Fucina (q.v.), and the Cloaca Maxima (q.v.). But it is since the 16th century that they have been most largely used. From the difficulties and uncertainty connected with their construction, they have proved to be the most costly part of the work in making canals and railways. In making a tunnel through an elevation of moderate height, the nature of the material to be excavated is first ascertained by vertical shafts at different points in its length. Some of these are temporary, others are permanent, and serve for ventilation when the tunnel is completed. These shafts must not be less than 9 feet in diameter, so as to admit of lowering and raising men and the material excavated, fixing of pumps, &c. Temporary shafts are simply lined with timber poling boards; permanent shafts are lined with brickwork as the work of sinking progresses. When the shafts have been completed, the work of excavating the tunnel can be started; each shaft provides two working faces from which excavation and lining work, if necessary, can be carried on. Thus, if there were five intermediate shafts, there would be twelve working faces, including the two at the tunnel ends; this enables the work to be carried through much more expeditiously than would be possible if the two end faces were alone available. In excavating the tunnel the usual procedure is first of all to drive a top or bottom heading right through from end to end; these headings are about 6 or 7 feet high and 3 or 4 feet wide; in soft ground, clay, or loose rock they require careful timbering at the top and sides. When the heading is completed, and any necessary adjustments in the centre line have been made, the work of excavating the tunnel to its full dimensions and of lining it with brickwork—except in the case of hard rock—is carried out in short 'lengths' of 5 or 6 yards by working forward from each of the two working faces of each shaft and from the two tunnel ends. The mining gangs excavate and timber a length, then directly their work is finished the bricklayer gangs proceed to put in the brickwork lining, withdrawing as the brickwork lining progresses the greater part of the timber to be used over again in another length by the miners. Sometimes the driving of the headings is omitted, and the tunnel is excavated to its full dimensions at one stage in the usual series of 'lengths.' Tunnels through lofty mountains, or below rivers or arms of the sea, can only be worked from the two ends, vertical shafts being impossible, and from the experience gained in recent years in tunnels of great length, and with improved boring and drilling machinery driven by compressed air, combined with the use of more powerful blasting materials, it is probable that where the conditions are suitable the older methods of constructing tunnels from vertical shafts will be abandoned, the comparative progress under equal conditions being in favour of the newer machinery by as much as three and four to one. Important departments of the work of tunnel-making have been already discussed in the articles Blasting (q.v.) and Boring (q.v.); see also MINING, AQUEDUCT, PNEUMATIC DESPATCH,

Railways. The construction of deep-level underground electric railways in London and in other great cities has been made possible by the development of the so-called 'Greathead Shield' method of working. By the use of this shield excavation can be carried out in material heavily charged with water, and at the same time the risk of settlement of the ground and of damage to buildings on the surface can be considerably obviated. Compressed air—at any suitable pressure—is delivered at the working face, and by means of air-locks the working face can be isolated from the rest of the excavated and lined tunnel; the lining of such tunnels is built up of cast-iron rings, each ring being made of a series of segments bolted together to make a complete ring. This method of construction was first adopted in the Blackwall tunnel under the Thames, constructed in 1891–97 by the London County Council at a cost of £1,500,000.

The longest in the world are the tunnels under the Simplon (12¼ miles), the St Gotthard (9¼ miles), the Lötschberg, the Mont Cenis, and the Arlberg, noticed under their several heads, as are also the other more important tunnels (see Hoosac Mountain, St Clair, &c.). The longest canal tunnels in England are the Marsden, on the Huddersfield Canal (5280 yards; opened 1798), and the Sapperton, on the Thames and Liverpool (4300 yards; 1790). The longest railway tunnels are the Severn tunnel (7665 yards; 1886), the Dore and Padley (6200 yards; 1892), the Stanbridge (5342 yards; 1839), and the Woodhead (5297 yards; 1867).

For full details of the construction of the Blackwall tunnel and of the London tube railways, see the *Proceedings of the Institution of Civil Engineers* (London, vols. 122, 123, 130, 133, 136, 139, 156).

Tunny. The tunnies belong to the mackerel family, or Scombridæ, and have somewhat the appearance of gigantic mackerel. There are several genera and species. The Common Tunny (*Thunnus thynnus; Thynnus vulgaris* of Cuvier, *Orcynus thynnus* of Günther) is the *thynnus* of the ancients. It is a large fish, reaching 9 feet in length, and 1000 lb. in weight. A remarkable fact

The Common Tunny.

is that the temperature of the brownish muscles is 10°–12° C. above that of the surrounding water—an approach to being warm-blooded. It occasionally occurs on the British coasts, but is particularly abundant in the Mediterranean. It has a large mouth with small teeth; two dorsal fins, the first elongated and reaching nearly to the second, which is shorter; behind the second dorsal and anal are eight or nine finlets like those of the mackerel. There is a keel on each side of the free portion of the tail, and the tail fin is crescentic. There are small scales all over the body, but they are larger in the anterior part, where they form a well-defined corselet. An air-bladder is present. The tunnies approach the coasts in summer, chiefly for the purpose of spawning, and it is at this time that the fishery is carried on. Like the mackerel, the fish are gregarious and migratory, but it is untrue that they all leave the Mediterranean in autumn, as was formerly supposed. The Phœnicians established a tunny fishery at a very early period on the coast of Spain, and the tunny appears on Phœnician medals of Cádiz and Carteia. Salted tunny was much esteemed by the Romans, and was called *Saltamentum Sardicum*. The tunny is generally captured by means of nets arranged in a funnel-like form, the fish entering the wide mouth of the funnel and being gradually driven to the narrow end, where they are killed by lances and harpoons. The line of nets is often more than a quarter of a mile long. The principal fisheries at the present day are at Cádiz, the Gulf of Lions, Corsica, Sardinia, Sicily, Tunis, and in the Black Sea. At Tunis most of the fish are cut up and preserved in olive-oil, and exported in tins; others are salted and sent to Malta and Sicily, but fetch only half the price of those in oil. The common tunny also occurs on the western side of the Atlantic, from the Caribbean Sea to Newfoundland. The Longfinned Tunny (*Thunnus germo*) is distinguished by the great length of the pectoral fins; it is scaled all over, and the corselet is ill-defined. It is much smaller than the common tunny, seldom reaching 3 feet in length. It is caught by long and strong 'whiffing' lines trailed from a boat, the fishery being principally carried on in the south part of the Bay of Biscay. A few stragglers have been caught on the coasts of Devon and Cornwall, but its ordinary range is from the Bay of Biscay to the Cape of Good Hope. The Bonito (q.v.; *Thunnus pelamys*) has no scales at all on its body except in the corselet. *Pelamys sarda* has very fine scales on the posterior part of the body, and a small corselet. Several species are called albacore and tuna, including the long-finned tunny, germo, or alalunga, abundant at certain seasons on the Californian coast. A few other species of these genera occur in the Pacific and Indian Oceans.

Tunstall, part (since 1910) of the county borough and (since 1918) of the parliamentary borough of Stoke-on-Trent. It has a town-hall (1884), manufactures of earthenware and iron, and neighbouring collieries.

Tunstall, Cuthbert, was born at Hackforth in Yorkshire in 1474, brother of the Sir Brian Tunstall who fell at Flodden. He was educated at Oxford, Cambridge, and Padua, and became in turn Rector of Stanhope, Archdeacon of Chester, Rector of Harrow-on-the-Hill, Master of the Rolls, Dean of Salisbury (1519), Bishop of London (1522) and of Durham (1530). In 1516 he went on an embassy to Charles V. at Brussels, and there formed a fast friendship with Erasmus. Between 1516 and 1530 he was often employed on embassies to France and Germany, and in 1527 he had accompanied Wolsey on his magnificent embassy to France. He accepted the Royal Supremacy, but took alarm at the sweeping measures of reform under Edward VI., and was at length in 1552 deprived, through the influence of Northumberland, who coveted the wealth of the see. The accession of Mary restored the bishop, but under his mild rule not a single victim died for heresy throughout the diocese. On Elizabeth's accession he refused to take the oath of supremacy and was deprived, September 29, 1559. About six weeks after he died at Lambeth in the house of Archbishop Parker, and was buried in the chancel of Lambeth church. Tunstall was a ripe scholar and an admirable man, but left little beyond a defence of transubstantiation and a number of Latin prayers. He was uncle to the famous apostle Bernard Gilpin.

Tupelo, a name given to several trees of the Cornaceæ, genus Nyssa, natives chiefly of the

southern parts of the United States, having simple alternate leaves, mostly entire, greenish inconspicuous flowers at the ends of long stalks, the fruit a drupe. *N. sylvatica* attains a height of 60 to 70 feet. It is often called Black Gum Tree or Pepperidge. *N. aquatica*, the Tupelo Gum or Large Tupelo, is a lofty and beautiful tree, remarkable for the extraordinary enlargement of the base of the trunk, which is sometimes 8 or 9 feet in diameter, whilst at no great height the diameter diminishes to 15 or 20 inches. The fruit resembles a small olive, and is preserved in the same way by the French settlers in America. *N. Ogeche*, the Ogeechee Lime or Sour Gum Tree, is a small tree, of which the fruit is very acid, and is used like that of the lime. *N. sinensis* is a recently discovered Chinese species. The wood of all the species is peculiarly curled in the grain, rendering the fibre very tenacious and difficult to split, and is in request for making naves of wheels, hatters' blocks, &c., but is not otherwise valuable.

Tupi, a tribe of South American Indians originally inhabiting the northern tributaries of the La Plata, followed the coast north to the mouths of the Amazon, whence they were driven by the Portuguese in the 16th century to the upper reaches in the interior. The Tupi are strongly built, practise agriculture to some extent, cultivate a few industries, but live chiefly by hunting and fishing. Some of them have adopted Christianity, but most of them practise a form of nature worship. They are very closely allied to the Guaraní (q.v.). See BRAZIL, p. 409.

Tupper, MARTIN FARQUHAR, D.C.L., F.R.S., poet and inventor, was born at Marylebone, 17th July 1810. His father, an eminent London surgeon, who twice refused a baronetcy, came of a family, originally German, which since 1550 had been settled in Guernsey. Martin was educated at the Charterhouse and under five private tutors, and at nineteen went up to Christ Church, Oxford. A stammer hindered him from taking orders, so, after graduating in 1831, he entered Lincoln's Inn, and in 1835 was called to the bar. But a single will and marriage settlement was his first and last exploit in the way of law; he had found his vocation in a life of authorship. Its chief events were his election to the Royal Society (1845), two visits to America (1851, 1876), and a series of English and Scotch readings from his own works. Of those works, forty in number, one, *Proverbial Philosophy* (3 series, 1838–67), brought him and his publisher, Hatchards, a profit of 'something like £10,000 apiece.' His inventions were not such successes (safety horseshoes, glass screw-tops to bottles, steam-vessels with the paddles inside, &c.). A friend 'whose ambition it was to be Tupper's Boswell' predeceased him; but from his own huge 'archives' he compiled *My Life as an Author* (1886)—a curious self-study of a poet. He died at Albury, his Surrey home, on 29th November 1889.

Turanian, a philological term apt to be misleading and now going out of use. Originally the word *Turan*, meaning '*not Iran*,' was used by the Sassanian kings of Persia for those parts of their empire outside of Iran (q.v.), and the Persians still know Turkestan under this name. Hence in philology 'Turanian' came to be used for the non-Aryan languages (see ARYANS, &c.) of those regions —languages of the Ural-Altaic or Finno-Tatar group (see ASIA). But the term was extended sometimes so as to include the Dravidian tongues of India, also of the agglutinative type (see PHILOLOGY, p. 100); thus erroneously suggesting affinity between non-Aryan and non-Semitic groups of languages which are probably quite unconnected.

Turbary, in law, is a right to go upon the soil of another, dig turf, and carry it away.

Turbellarian. See PLANARIAN.

Turberville, GEORGE (1540?–1610?), poet and secretary to Sir Thomas Randolph (q.v.), whom he accompanied to Russia, wrote epigrams, songs, sonnets, poems on Russia (1568), *The Booke of Faulconrie* (1575), *The Noble Art of Venerie* (1576), and translations from the Italian poets. His father was an inhabitant of Whitchurch in Dorset, and spelt his name Turbervile.

Turbine. See STEAM-TURBINE, WATER (*Water-power*), SHIPBUILDING.

Turbinella. See CHANK-SHELL.

Turbot (*Psetta maxima*), one of the Pleuronectidæ or Flat-fishes. The genus Psetta, includes the turbot and brill, having the eyes on the left side, which is uppermost; the mouth is terminal and large; the shape rhomboidal; the lateral line has a semicircular curve above the pectoral fin. The dorsal fin commences on the snout in front of the eyes, and its rays like those of the ventral are branched. The turbot is distinguished from the brill by the fact that it has no scales, but on the upper side bony plates in the skin from which blunt tubercles project: it is also broader in proportion than the brill. The adult turbot is about 2 feet long, and it has been known to reach a weight of more than 30 lb. It feeds principally on other fishes, but also on crustaceans,

Turbot (*Psetta maxima*).

molluscs, and echinoderms. It occurs on sandy ground all round the British and Irish coasts, becoming rarer towards the north. The largest supply comes from the North Sea. It breeds in summer: the eggs are very small and are buoyant or pelagic. Buckland calculated the number of eggs in a single female at over fourteen millions. The young, unlike those of other flat-fishes, are provided with an air-bladder, and continue to swim at the surface during their metamorphosis. At this period of life they approach the shores, and are found in harbours and bays. After the metamorphosis the young fish remain in shallow water, where also larger specimens occur in summer-time. Owing to its predaceous habits and large mouth, the turbot is caught on hooks as well as by the trawl. The range of the turbot extends along the coasts of France and in the Mediterranean as far as the Adriatic. Like the sole, it is entirely absent from the American coast, though the name 'turbot' is applied to species of Paralichthys and Reinhardtius. A relative of the turbot, *Lophopsetta maculata*, found on the coasts of New England and New York, is of little value as food from the extreme thinness of the body, to which it owes its common name of 'window-pane.' It rarely exceeds a pound or two in weight.

Turcomans. See TURKESTAN.

Turcos, a popular name for the Tirailleurs Algériens, a body of native Algerian troops recruited for the French service.

Turdidæ. See THRUSH.

Turenne, HENRI DE LA TOUR D'AUVERGNE, VICOMTE DE, one of France's military heroes, was the second son of the Duke of Bouillon and Elizabeth of Nassau, daughter of William (I.) of Orange, and was born at Sedan, 11th September 1611. Brought up in the Reformed faith, he was sent, on the death of his father in 1623, to Holland, where, under his uncle, the celebrated Maurice (q.v.), he was initiated into the art of war. Returning to France in 1630, he was favourably received by Richelieu, who at once gave him a commission. During the alliance of France with the Protestants in the Thirty Years' War he fought with distinction (part of the time under Bernhard of Weimar), and helped to bring about the capture of Landrecies, Maubeuge, and Breisach. The victory of Casale in the Italian campaign of the following year added to his laurels, and in 1641 he was entrusted with the supreme command. The rapid conquest of Roussillon from the Spaniards in 1642 was rewarded in 1644 with the baton of a marshal of France and the chief command on the Rhine. Condé's arrival transferred him for a time to a subordinate position; and his restoration to supreme command was followed by the commission of a strategic error for which he was severely punished by the Imperialist general Count Mercy, who completely routed him at Marienthal, 5th May 1645; but on August 3 of the same year this disgrace was amply avenged by Condé at Nördlingen; and Turenne gloriously concluded France's share in the war by the reconquest of the Trèves electorate, by the conquest of Bavaria (1646–47) with the Swedes, and by a successful campaign in Flanders.

In the civil wars of the Fronde (q.v.) Turenne joined the party of the *frondeurs*, moved by his passion for the Duchess of Longueville; but after being defeated at Rethel (December 15, 1650) he withdrew to Flanders, returning on Mazarin's retirement. On the minister's return Turenne joined his party, while Condé deserted to the *frondeurs*, and the two greatest generals of the period were for the first time pitted against each other. Turenne triumphed over his former chief at Gien and the Faubourg St Antoine (1652), and ultimately forced him to retire from France; after which he subdued the revolted cities, crossed the northern frontier, and conquered much of the Spanish Netherlands. His defeat of Condé at the Dunes (1658), with the help of Cromwell's 6000, closed their long struggle. In 1660 Turenne was created Marshal-general of France, and in 1668 he became a Catholic from loyalty. His next campaign in Holland was triumphant (1672), and the year after he held his ground against both the Imperialist Montecuculi and the Elector of Brandenburg. In 1674 he dashed across the Rhine, defeated the Duke of Lorraine at Sinsheim, next mercilessly ravaged the Palatinate, crushed Brandenburg at Colmar, laid waste Alsace, and then advanced into the heart of Germany again to meet a worthy antagonist in Montecuculi. But their famous four months' passage of strategy was left unfinished, Turenne being killed by a cannon-ball while reconnoitring at Sasbach, 27th July 1675. His remains, entombed at Saint Denis, were respected at the Revolution, and were placed by Napoleon under the dome of the Invalides.

[1]Turenne left *Mémoires* (published 1782); and there are Lives by Ramsay (Paris, 1733), Raguenet (1738), Duruy (5th ed. 1889), Hozier (Lond. 1885); and works on his strategy and tactics by Neuber (Vienna, 1869), Roy (Paris, 1884), and Choppin (Paris, 1875 and 1888). See also Picavet, *Les dernières années de Turenne.*

Turf. See PEAT, BETTING, HORSERACING.

Turfan, an important city and a fertile oasis in Chinese Turkestan (part of which is sometimes named after it), situated about 89° E. and 43° N. on the southern slope of the Tian-shan mountains and on a tributary of the Tarim River. Cotton, maize, and fruit are produced, but constant irrigation is necessary. Twentieth-century investigation has brought to light many Buddhist MSS. written in Uigur, Chinese, and Tibetan, Manichæan and Nestorian texts written in early Turki and Sogdian, while many Buddhist shrines and temples, with frescoes, sculptures, &c., have been discovered. This would suggest the great importance and prosperity of Turfan during the Middle Ages, reaching its highest point probably in the 11th century, when Manichæans and Buddhists lived apparently on good terms together. Pop. 20,000. See MANICHÆUS, TOKHARISH.

Turgenev, IVAN SERGEEVICH (whose family name is represented by spellings as various as *Tourghénieff, Turgenjew, Turgenief*), one of the greatest of Russian novelists, and the first to make the life of Russia familiar to western Europe, was born the son of a noble and wealthy family at Orel, 9th November 1818, and educated at Moscow, St Petersburg, and Berlin. For about a year he held a post in a government office (1840–41), but retired voluntarily into private life, subsequently living on his estate in Orel, at St Petersburg, or abroad. He became known as a poet in 1843; but his *Annals of a Sportsman* (1846) made him famous —especially for his singularly vivid pictures of the life of the serf and his powerful impeachment of the evils of serfdom. His outspoken liberalism in a *Letter on Gogol* (1852) led to a short imprisonment and his seclusion on his own estate till 1855. Thereafter he lived mainly in Baden-Baden (till 1871) and Paris—where he was a member of the most brilliant literary circles—with short summer visits to Russia. He died at Paris 3d September 1883; and his body was taken to Russia and buried at St Petersburg on the 9th October. A careful rather than a facile writer, Turgenev was a prolific author; though none of his novels is long (many of the most striking extend to only thirty or forty pages), and all are very slight in plot. In *Rudin* (1855), *A Nest of Nobles* (1858), and *Helene* (1860; trans. as *On the Eve*) he depicts scenes and characters from the period of enthusiastic dreaming and theorising; in *Fathers and Sons* (1861), *Smoke* (1867), and *Virgin Soil* (1876) he deals with the period of practical reform and the triumph of Slavophil ideas. But in the latter series he shows himself suspicious of a movement carried through on lines he, an admirer of the methods of western Europe, did not sympathise with, and he dwells too exclusively on the errors and extravagances of the new ideas, caricaturing Young Russia in a manner that gave much offence and led to the author's being regarded as reactionary. His freshness, noble realism, and poetic insight are somewhat impaired by increasing pessimism and hopelessness: the really good men are mostly fools, and progress leads but to evil continually. His accuracy of observation, variety of interests, and width of sympathy are everywhere visible; he is a master in the art of character-sketching; and his style is singularly finished and perfect. Even in France he was by many regarded as the greatest novelist of his time. He left several collections of epic and lyric poems and a series of dramas. In person Turgenev was exceptionally tall and strongly built, with a majestic bearing; his hair and full beard were in his later years silver-white. He was a magnificent talker in several tongues; some of his novels he wrote in French. He had

read much English literature and paid several short visits to England.

The novels of Turgenev have been translated into English by C. Garnet (15 vols. 1894–99) and others; see the general books cited at RUSSIA (*Literature*); there are studies in English by E. Garnet (1917), Yarmolinsky (1927), in French by Delines (1888), Haumant (1906), in German by Zabel (1884); see also books on Turgenev and Tolstoy by Kühnemann (in German, 1893), and Lloyd (in English, 1910).

Turgot, ANNE ROBERT JACQUES, an eminent French statesman, born at Paris, May 10, 1727, was descended from one of the most ancient families of Normandy. His father held the highest municipal offices at Paris. In his boyhood Turgot was shy, over-sensitive, and awkward; and these failings were aggravated by the harshness of his mother. Being a younger son, he was educated for the church; but soon after attaining to manhood he resolved to abandon the ecclesiastical for the legal profession; 'he could not consent,' he said, 'to wear a mask all his life.' At an early age he had joined the ranks of the philosophic party, who were rapidly imbuing the opinion of France and of Europe with new ideas. Even before he left the Sorbonne, where he had a distinguished career, he wrote essays which gave him a place among the most enlightened students of history of his time. After holding some legal appointments of subordinate importance Turgot was appointed to the office of Intendant of Limoges in 1761. Though more than once invited to more attractive positions, he filled the post for thirteen years, eagerly and resolutely striving to apply to his province the principles of justice and progress, which he loved. The Limoges was in a very low condition when he entered on his functions. In many ways it was merely a sample of the prevalent state of things all over France before the Revolution; in some respects it was worse than other districts. The soil was not fertile, and the natural defects of the soil were made unspeakably worse by a system of government which was irrational and unjust to a degree almost inconceivable. The people were poor, rude, immoral, and superstitious, the victims from time immemorial of ignorance, degradation, and oppression. Turgot introduced a better administration of imposts, and succeeded in abolishing the method of repairing roads and bridges by compulsory labour. He introduced the cultivation of the potato into the Limoges, overcoming the prejudices of the inhabitants by using it at his own table. In 1770 he had to meet a famine, which lasted two years and reduced the people to the severest straits. It should be said that the central government, of which Turgot was the representative, readily supported him in his schemes as far as it was able; and he also received cordial assistance from the rural priests in reaching the minds of the people. The evils with which he had to contend were rooted in the social and political system of France, especially in the overgrown privileged classes, which, as intendant, he was powerless really to change.

On the accession of Louis XVI. in 1774 Turgot had a brief opportunity of attempting the regeneration of France on a wider scale. He was first appointed minister of Marine, and soon afterwards controller-general of Finance, at that period the most important department of government. His rise was hailed with joy by his friends Voltaire, Condorcet, and other chiefs of the school of progress; it was fervently hoped that by a philosopher in power great things would be accomplished. In his letter to the young king he adopted as the principles of his administration that there should be 'no bankruptcy, no augmentation of imposts, no loans;' and he at once entered upon a comprehensive scheme of reform. He reduced the expenditure, augmented the public revenue without imposing new taxes, and introduced exactness of payments and fidelity to engagements into all his financial operations. He sought to break down that immunity from taxation which had been enjoyed by the privileged classes, and so effect a better distribution of the burdens of government. He established free trade in grain throughout the interior of the kingdom of France, and in every way sought to remove the fiscal barriers which prevented free intercourse between the various provinces of the country. He also issued an edict to abolish the exclusive privileges of the *jurandes* or trade corporations, maintaining that the free right of labour was the first and most sacred right of humanity. It need not be said that these efforts towards a more economical, efficient, and equitable administration brought him into antagonism with all the privileged orders of France. Courtiers, nobles, prelates, farmers of revenue, financiers, and the members of the trade corporations alike saw their selfish interests menaced by the innovations of the new minister, and they combined for his overthrow. Louis XVI. was too weak to resist such pressure. He had not been in full sympathy with the philosophic minister. He complained that his controller-general never went to mass. Turgot was too austere, reserved, and perhaps also too inflexible and doctrinaire; and it was certainly a tactical mistake to unite against himself so many enemies. He attempted too many reforms during the short time he was in power. It may be that he lectured the king too severely on his duty as ruler. Yet Louis greatly esteemed his minister. He had once sadly observed, 'It is only M. Turgot and I who love the people.' The end was that Turgot was dismissed after holding office for twenty months, and France drifted rapidly into the great catastrophe of 1789. He retired quietly into private life, where he occupied himself with literature and science till his death from gout, March 8, 1781.

The efforts of Turgot towards a reform of the French political system have a profound and pathetic significance. By reason of his integrity, zeal for the public good, and administrative intelligence, Turgot was the best man to undertake the regeneration of France. 'He has,' Malesherbes said, 'the head of Bacon and the heart of L'Hôpital.' In practical affairs he was the fittest and most capable representative of the new ideas; and it was natural that Voltaire and other chiefs of the new school should lament his failure as a misfortune that touched them most nearly. It really meant that the hope of a reasonable and temperate change had passed away, through the weakness of the king and the folly and selfishness of the privileged classes. 'The part of the sages was played out; room was now for the men of destiny.'

Turgot's most important work was his *Réflexions sur la Formation et la Distribution des Richesses* (1766). It is the highest development of the Physiocratic school, with its excellences and also some of its characteristic errors, as that agriculture is alone productive, and that there should be only one tax, that on land; and it largely anticipates the teach- of Adam Smith. See POLITICAL ECONOMY.

See Condorcet, *Vie de Turgot* (1786); Lavergne, *Les Économistes Français au Dix-huitième Siècle* (1870); Neymarck, *Turgot et ses Doctrines* (1885); Morley, *Critical Miscellanies*, vol. ii.; Léon Say, *Turgot* (trans. by G. Masson, 1888); W. Walker Stephens, *The Life and Writings of Turgot* (1895); Whyte, *Great Statesmen* (1910).

Turin (anc. *Augusta Taurinorum;* Ital. *Torino*), a city of Northern Italy, formerly capital of

Piedmont and of the kingdom of Sardinia, and for a time (1860–65) of the kingdom of Italy, is situated in a beautiful plain bounded by mountains, near the confluence of the Po and the Dora Riparia, 54 miles from the Cenis tunnel by rail, and 80 miles NW. of Genoa. It stands at the meeting-point of several great roads through the Alps, and strategically has been of great importance. At present it is an important railway centre. Really a very ancient city, it has a very modern appearance: ancient moats and fortifications have been removed, and the place is famed for its handsome streets which intersect at right-angles, its squares and gardens, and for its fine view of the Alps. Some of the largest squares are Piazza San Carlo, Piazza Castello, Piazza Vittorio Emanuele, Piazza Carlo Felice, &c. Among the numerous churches are the cathedral of San Giovanni, a cruciform Renaissance edifice, built in 1492–98 on the site of a 7th-century church (it contains the famous 'Sudario' said to be the shroud in which Jesus' body was wrapped); San Filippo Neri, the finest church in Turin, rebuilt by the Sicilian Juvara (1685–1736); La Consolata, containing several striking statues and a wonder-working Madonna; La Gran Madre di Dio; San Lorenzo with a dome by Guarini (1624–83), &c. On the summit of a hill near the town is La Superga, a splendid basilica, raised by Victor Amadeus II. in 1717–31 to fulfil a vow, and now the mausoleum of the House of Savoy; its terrace, reached by a cable railway, is a favourite resort for the enjoyment of a glorious view. Among the 'palaces' must be noticed the royal palace designed by Castellamonte, rather poor in outward appearance but containing a fine collection of armour, MSS., and drawings; the Castello del Valentino, partly in the French style (1633); the Palazzo Madama; the Palazzo Carignano, by Guarini, with the theatre of the same name opposite to it; the town-hall; the university, with a valuable library (many of its volumes and MSS. burnt with the building in 1906); the Accademia delle Scienze, once the Jesuit college, containing the museum (important especially for its Egyptian collection) and the picture-gallery; the seminary; the hospital of San Giovanni. The private palaces are numerous and vast, but not in a noble style of architecture. The most important modern building is the so-called Mole Antonelliana, called after its architect, built in 1863–88, with a dome and a lofty spire 510 feet high. The number of statues is exceptionally great, and many of them are fine. Among famous natives were Gioberti, Cesare Balbo, Cavour, Marochetti, d'Azeglio, and the French mathematician Lagrange. The manufactures of Turin, which in Italy is second only to Milan as a manufacturing town, consist of motor-cars (especially the famous Fiat cars, the name being an abbreviation of Fabbrica Italiana Automobili Torino), cotton, woollen, and silk fabrics, carpets, velvet hats, paper, iron, pottery, leather, glass, dresses, gloves, bijouterie, furniture, wax matches, tobacco, and liqueurs. Pop. (1700) 40,000; (1800) 42,000; (1881) 233,134; (1901) 335,656; (1911) 427,462; (1921) 502,274. Turin was originally inhabited by the Taurini, a tribe of Ligurians. It is first mentioned in history in the time of Hannibal, by whom it was taken and sacked on his descent into Italy. Turin became a Roman colony under Augustus, and its rectangular plan, which seems so modern, is simply due to the prolongation of the old Roman street-lines in the various extensions of the town from 1600 onwards. The north and east gates still exist, with the two lofty towers which flanked them, and considerable remains of the Roman theatre have also been excavated. On the fall of the empire it passed to the Lombards, and became the capital of one of the thirty Lombard duchies. Charlemagne made it the residence of the Duke of Susa, whose line ruled till 1045, when the house of Savoy succeeded it. It was taken by the French in 1536, and was held by them until 1562. They once more took it in 1640; and in 1796 it was dismantled, and in 1800 united to the French Republic with the name of the department of the Po. In 1814 it was restored to the house of Savoy. See works by Cibrario (1847), Promis (1869), Borbonese (1884), and Toesca (1911).

Turina, JOAQUÍN, Spanish composer, pianist and conductor, was born at Seville in 1882, began the study of music early, and later studied with Moszkowski and d'Indy at Paris. He has written operas, *La Procesión del Rocío* and other symphonic poems, chamber music, songs, and pianoforte works, most of which reflect the gay colouring and fresh vigour of Andalusia. In 1917 he published an Encyclopædia of Music.

Turkestan, 'the country of the Turks,' called by the Persians *Turan* (see TURANIAN), has come to be applied to an extensive region of central Asia, bounded on the north by Siberia, on the east by Mongolia, on the south by Tibet, Kashmir, Afghanistan, and Persia, on the west by the Caspian Sea and Russia in Europe. It is divided generally and politically into Western or Russian Turkestan and Eastern or Chinese Turkestan, the former implying, geographically, Russian Central Asia, and the latter the province of Sin-Kiang. The Kirghiz Steppes, sometimes taken as interposing between Siberia and Turkestan, are here regarded as part of the latter. A lofty tableland, the Pamir (q.v.) separates the rivers eastward to the desert of Gobi from those which run into the Sea of Aral.

WESTERN TURKESTAN.—*Physical Features.*—Western Turkestan, or simply Turkestan, consists of the great hollow depression of the Caspian and Aral Seas, which occupies its west and centre, of the plain round Lake Balkhash on the east, of the Kirghiz Steppes to the SW. of Siberia, and of the hilly and well-watered districts formed by the ramifications of the western Tian-shan Mountains and the northern Hindu Kush, which frequently rise to over 20,000 feet. The plains are composed of deserts of loose shifting sand, interspersed with oases where a subsoil of clay renders the formation of lakelets of rain possible; and of strips of fertile land along the banks of rivers, with occasional tracts clad with coarse thin grass. The eastern districts abound in valleys of remarkable fertility. There is but little doubt that many changes have taken place in the surface of Turkestan, and that, for example, the united Caspian and Aral Seas originally extended over a vast region to the north-east; they were connected with Lake Balkhash, and, by means of the river Ob, with the Arctic Ocean. The process of subsidence is still continuing. The climate varies on the plains from extreme cold to burning heat; in the eastern highlands, although the cold is almost as intense in winter, the heat of summer is much less. The principal rivers are the Syr-Daria (see JAXARTES) and Amu-Daria (see OXUS), which flow into the Sea of Aral; the Zarafshan, Murghâb, Chu, Sary Su terminate in the flat country in central Turkestan. The Kirghiz Steppes are drained by the Tobol, Ishim, and Irtish rivers, all tributaries of the Ob, while the Ural and Ili rivers flow into the Caspian Sea and Lake Balkhash respectively. For the fauna and flora, see ASIA, pp. 497, 498. About half the area of Turkestan is desert land, and only a small proportion of the remainder can be used for arable. Irrigation is practised fairly extensively, but, with the necessary capital, much more land could be used than is so at present. In the south cotton is the principal crop, and the cotton-seed-oil

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and silk industries are important. Wheat, barley, rye, oats, rice, fruit, and vegetables are grown, Ferghana in the SE. being the most fertile region. Coal and other minerals are found, but are not worked to anything like their full extent; salt is abundant, large tracts of desert being strongly impregnated and even crusted over with it. Breeding of horses, sheep, and other domestic animals is carried on to a great extent, especially in the Kirghiz Steppes, where camels are used; lamb-skins are valuable. Manufacturing industry is also considerable, the produce consisting of cotton, silk, linen, and woollen goods, shagreen (superior to that manufactured in Europe) and other kinds of leather, paper made of raw silk, carpets, rugs, and a few sabres, knives, and rifles. Raw cotton, wool, and hides are exported. The Central Asia Railway extends from Krasnovodsk on the eastern shore of the Caspian Sea, south-east to Poltaratsk, Merv, north-east to Leninsk, Bokhara, east to Samarkand, Khokand, to Andijan, the main line being built 1880–88, a distance of some 1270 miles. Branches go from Merv and Bokhara south to Kushk and Termez respectively on the Afghan frontier, and a line north to Tashkent branches off between Samarkand and Khokand. The Tashkent-Orenburg (and thence to Samara and the European railway net-work) line of some 1150 miles distance was finished in 1905. Various extensions have been proposed. Though the railways were originally planned primarily for military purposes, business and trade have since developed very considerably. The building of the lines was troublesome in many parts, owing to the drifting sand, and transport is still a difficult problem, though road-construction and air services have been taken in hand.

Area and Population.—Up to the Russian Revolution of 1917 the political divisions of Russian Central Asia, with estimated areas and populations, were as follows (though accurate figures have never been obtainable):

	Area in sq. m.	Pop. (1915).
Steppes, comprising the governments of Akmolinsk, Semipalatinsk, Turgai, Uralsk	710,905	4,017,200
Turkestan, comprising the governments of Ferghana, Samarkand, Syr-Daria, Semiryechensk	420,807	6,684,400
Trans-Caspian Province	235,120	552,500
Bokhara (semi independent)	83,000	1,250,000
Khiva (semi independent)	24,000	646,000
TOTAL	1,473,832	13,150,100

There are separate articles on most of these territories. The name 'Turkestan' was here applied to a political division, but for purposes of exploitation and administration (such as the construction of railways, irrigation works, &c.) the general government of 'Turkestan' included also the Trans-Caspian Province, Bokhara, and Khiva (but not the Steppes). After the Revolution the boundaries were altered, and a complete reorganisation took place (see *History*), and in 1925 the estimated areas and populations were as follows (though the delimitation of the frontiers was incomplete):

	Area in sq. m.	Pop.
Kirghiz-Cossack Region, comprising the Steppes, part of Turkestan proper (to the E. and SE.), and part of the Trans-Caspian Province	1,223,792	6,409,500
Turkmenistan, comprising part of the Trans-Caspian Province, and the western parts of Bokhara and Khiva	178,756	965,500
Uzbekistan, comprising the eastern parts of Bokhara and Khiva, and part of Turkestan proper (to the W.)	71,346	4,000,000
TOTAL	1,478,894	11,375,000

The Cossack (till 1925 Kirghiz) republic is an autonomous republic forming part of Russia proper (capital Ksyl-Orda). The name Kirghiz republic was in 1925 transferred to what had been the Kara-Kirghiz, in the extreme SE., an autonomous republic from 1926 (capital Pishpek). The Kara-Kalpak autonomous territory round the SE. of the Sea of Aral was set up in 1924 (capital Turtkul). Turkmenistan and Uzbekistan (the latter containing the autonomous republic of Tajikistan on the extreme S.) are themselves constituent members (since May 1925) of the Union of Soviet Socialist Republics. The principal towns of Turkmenistan, are the capital, Leninsk (Charjui), Karichi, Poltaratsk (lAskhabad), Merv; of Uzbekistan, the capital, Samarkand (101,000), Tashkent (245,000), Khokand (120,980), Andijan (79,730), Bokhara (75,000), Namanchan (70,500), Khiva. The administrative divisions were made on the basis of the ethnographical distribution, and Kirghiz predominate in the Cossack republic, Kara-Kirghiz in the Kirghiz, Turkomans, Uzbeks, Kara-Kalpaks, and Tajiks predominate in the respective territories named after them. There are also numbers of Russians, Cossacks, Persians, Afghans, Jews, &c. The Kirghiz lead largely a nomadic life, but the Uzbeks, when settled in towns, are designated 'Sarts.' There are separate articles on these peoples (see also TURANIAN), the majority of whom belong to the Turkish race (see TURKS), are Turkish-speaking, and are Sunnite Mohammedans. Education is in a very elementary state.

History.—Turkestan has played an important part in Asiatic history from the very earliest times. The contests between the Iranian and Turanian races occupy a prominent place in Firdausí's sketch of the semi-mythical traditions of Persia; and the earliest light of history shows us Bactriana (Balkh) and Sogdiana (Bokhara) as well cultivated and populous countries, generally attached to the old Persian empire, and inhabited by Persians, to whom most of the prominent cities of Turkestan owe their origin. With Persia, Turkestan passed into the hands of the Macedonians, who made Bactria an independent Greek kingdom, while the rest was in possession of the Parthians or 'Wanderers.' Under the Sassanides the Persian boundary was again advanced to the Jaxartes; but the gradual gathering of Turkish tribes from the north-east on the right bank of that river led to a constant state of warfare on the frontier, which ultimately resulted in the occupation of *Mavera-ul-neher* ('the country between the rivers'—i.e. the Oxus and Jaxartes) and of Kharism (Khiva) by the invaders. In the 8th century of the Christian era the Arabs possessed themselves of Turkestan, and during the decline of the khalifate it became the seat of various minor dynasties, as the Samani in Mavera-ul-neher, and the shahs of Kharism. After a brief union with the Seljuk empire in Persia it was mostly united to Kharism, and along with it overrun by the Mongol hordes under Genghis Khan (q.v.), on whose death it became one of the four divisions of his vast empire, and was allotted to his second son Jagatai—after whom was named the Turkish dialect formerly spoken in Persia and all over the East. On the decline of Jagatai's dynasty Timûr (see TAMERLANE) rose to supreme authority in Turkestan, and in the course of a thirty-five years' reign made it the centre of an immense empire, which stretched from the Hellespont to the frontiers of China, and from Moscow to the Ganges. This period was the golden age of Turkestan; its powerful monarch was never weary of adorning its cities with the spoils of victory; colonies of learned men, skilled artisans, and all whose knowledge or abilities could be of service to his subjects, were either transferred

to Turkestan from the countries he had conquered or induced by the most munificent offers to settle there; under him and his more immediate successors Samarkand became a focus of enlightenment and learning. The Chinese historians say that when 'the Yüan (i.e. Mongol dynasty) son-in-law' Timûr had become King of Samarkand, he sent his son Sha-ha-lu (Shah Rokh) to occupy Herat, who was not on good terms with his nephew Ha-li (son of Míran Shah). But after the death of Shah Rokh, Timûr's youngest son, the empire was split up into numerous fragments; and after a time a new dynasty snatched Persia from Timûr's family, while the Uzbeks, under Sheibanî Khan, drove them (1500) from the country north of the Amu-Daria; one of the expelled princes, Bâber Mirza, who had ruled in Ferghana (the south half of Khokand), subsequently founding the 'Great Mogul' empire in India (1519–26); the Chinese make no mention of Ferghana (Pa-han-na) so late as this. The Uzbek empire generally included Badakhshan, Herat, and Meshed; but these were lost on its division, in 1658, into various independent khanates. Khiva was conquered by Nadir Shah in 1740, and Bokhara, which had been conquered by the Uzbeks in 1505, was limited to the north bank of the Amu-Daria; but the Kirghiz of the Little Horde restored the independence of Khiva, which they ruled till 1792, when the Uzbeks regained possession; and Shah Murad (1806–22) effectually gave back its former extensive sway to the Bokhariot sceptre. Khokand, after emancipating itself from the authority of Sheibanî's successors, was incorporated with Bokhara, but afterwards united with the states of Eastern Turkestan.

Subsequent history of Turkestan records a series of wars between Bokhara and Khokand, and Bokhara and Khiva, in which the Bokhariots had generally the advantage, owing to the aid of the Turkomans of the southern desert; the raids of the Turkomans along the northern frontier of Persia; the advance of the Afghans from the south-east; and the progress of Russian conquest from the north and west. In 1849 the Afghans invaded the south-eastern part of Turkestan for the recovery of possessions they claimed north of the Hindu Kush. In 1850 they took Balkh and Khulm, and in 1859 Kunduz, Badakhshan at the same time submitting to pay a large tribute. In 1860 the Persians marched against the Turkomans, but were defeated, and lost 15,000 men and 30 guns. In 1865 a more successful expedition proceeded against Sarakhs. Elsewhere the Russians bade fair soon to absorb all that remained of independent Turkestan; in 1864 they took Tashkent and Khokand. A struggle followed with Bokhara; on the 20th May 1866 was fought the important battle of Irjar, when the emir had to flee for his life. In 1868 the Russians, 8000 men, again advanced. The troops of the emir, 40,000 men, took to flight; and a treaty was concluded by which Bokhara transferred Samarkand to Russia, and in 1873 Bokhara became practically a Russian dependency. The same year a Russian expedition was sent against Khiva; a great part of Khivan territory north of the Amu-Daria was ceded to the conquerors, and after a fierce struggle in 1875 and 1876 with the warlike inhabitants of Khokand, Russia formally annexed the whole. In 1879 the Russians unsuccessfully attacked the Akhal Tekke Turkomans living on the southern edge of the Kara Kum desert, between the Caspian and Merv; but in 1880–81, under Skobeleff, they completely subjected the Tekkes, and Merv became Russian. In 1885 a long talked of commission, English and Russian, was appointed to delimit the frontier in dispute between Afghanistan and Turkestan, especially in the Steppe region between Merv and Herat, and ultimately Penjdeh and Pul-i-Khatun were left to Russia, and Maruchak and Zulfikar to Afghanistan (q.v.).

After the Russian Revolution of 1917 various political parties, notably the Bolsheviks, the advanced Kirghiz, and the liberal Bokhariots, contended for power. The Khan of Khiva and the Emir of Bokhara were deposed in 1919 and 1920 respectively, and Soviet republics established, and in the latter year the Kirghiz (afterwards Cossack) Republic (at first confined to the Steppes) was set up. In the confusion which followed, Enver Pasha put himself at the head of guerilla bands, and worked against both Moscow and Angora, but was assassinated at Bokhara in 1922. In 1924 a commission appointed by the Union Central Executive Committee created the Turkmenistan and Uzbekistan republics. The political situation, however, is uncertain.

See books on Russian Turkestan by Schuyler (1877), Meakin (1903), Curtis (1911); Curzon, *Russia in Central Asia* (1889); Skrine and Ross, *Heart of Asia* (1899); Pumpelly, *Explorations in Turkestan* (1903 *et seq.*); Shoemaker, *Heart of the Orient* (1904); S. Graham, *Through Russian Central Asia* (1916); Christie, *Through Khiva to Golden Samarkand* (1925); books on Bokhara by Vambéry (1877), Olafsen (1911), on Merv by O'Donovan (1882); works on Turkestan in German by von Schwarz (1900), in French by Krafft (1901), Voeikov (1914); see also TAMERLANE.

EASTERN TURKESTAN is now known as the Sin-Kiang or New Dominion, includes Kulja and Kashgaria, and is regarded as a separate province of China. Towards the east it sinks to the desert plain of the Gobi, round the western bay of which it forms a vast crescent-shaped oasis from 4000 to 5000 feet in elevation, drained by the tributaries of the Tarim. The Tarim basin is surrounded by lofty mountain ranges, which rise in places to some 25,000 feet, the Altyn Tagh in the SE., the Kuen Lun in the S., the Kara Koram in the SW., while from the Pamir in the W. there extends to the NE. the Tian-shan, which separates Kulja from the rest of the province. There are great extremes of temperature. The Takla Makan, a stretch of arid sandy desert, interposes between the Tarim and the western Altyn Tagh, but to the north of the Tarim there are fertile oases. This river flows eastward and empties itself in the Lob-nor, after a course of 1500 miles. The Lob-nor, a lake, or rather series of lakes and marshes, inhabited by a curious people probably of Aryan descent, was first visited by Prjevalsky in 1877. The region around it is very desolate and unattractive. (See ASIA, p. 492.) Canals ramify through the country, sometimes crossing one another at three levels, but large areas are very unproductive. The people are mainly Turkis (called Sarts by the Russians)—a mixture of Tajiks with their conquerors, the Uzbeks, and are Turkish-speaking Moslems of the Sunni sect. The Chinese proper are very much in the minority. The general level of education is low. Agriculture is practised, and with irrigation, the production of cotton (already considerable) would assume enormous importance, while much silk is grown; the country is rich in minerals—gold, silver, copper, iron, coal; there are good oil-fields, and jade is worked, but everything is still very undeveloped. The inhabitants are skilful in making gold and silver stuffs, carpets, and linen, woollen, cotton, and silk goods. The governor resides at Urumtsi, the capital, and there is a British representative at Kashgar (q.v.); other important towns are Yarkand, Kulja or Ili, and Khotan. Area estimated at 550,340 sq. m., and population from 1,200,000 to 2,000,000. Excavations and discoveries by Sven Hedin (q.v.), Sir

M. A. Stein (q.v.), and others have illustrated the close Buddhist connection between India and China *viâ* Turkestan during the first millenium A.D. (see TUN-HUAN, TURFAN), while an Indo-European language (see PHILOLOGY, p. 100) was discovered and named Tokharish (q.v.). Little, however, is known of Eastern Turkestan, except from Chinese sources, previous to its conquest by Genghis Khan. After the decay of his empire into petty states, among which were Kashgar, Yarkand, Aksu, and Khotan, the chiefs of these were constantly quarrelling with each other, till several of the leaders, with the Yarkand prince at their head, invited the Chinese to take possession of the country, which had long been subject to Eleuth or Kalmuck exactions, and in 1758 it became a province of China. In 1864, however, a mutiny among the Chinese troops induced the dispossessed native chiefs to stir up a Mohammedan insurrection. They invited a Khokand prince, Buzurg Khan, to assume the government; and he, through his lieutenant Yakoob Beg, dispersed the Chinese garrison. But the lieutenant soon superseded him, and became sole emir under the title of Atalik Ghazi. He possessed civil as well as military capacity, and raised the country to a state of considerable prosperity. From 1869 he successfully resisted the encroachments of Russia, but in 1876 the Chinese again advanced, defeated him, and retook their old province in 1877. Kulja, taken by the Russians from the rebels against Chinese authority in 1871, was retained by Russia in spite of the Chinese protests. In 1881, however, Chinese persistence carried the point, and Kulja was restored to China. After the establishment of the republic in 1912, the inhabitants were granted a status as one of the 'Five Races'—Chinese, Manchu, Mongol, Tibetan, and Musulman—with representation on the flag accordingly. A treaty of commerce was signed with Russia in 1924.

See Prjevalsky, *From Kulja across the Tien Shan* (1879); Lansdell, *Chinese Central Asia* (1893); Deasy, *In Tibet and Chinese Tartary* (1901); Church, *Chinese Turkestan* (1901); S. Hedin, *Central Asia* (1903); Huntington, *Pulse of Asia* (1908); various books by M. A. Stein, including *Ruins of Desert Cathay* (1912); E. C. and P. M. Sykes, *Deserts and Oases of Central Asia* (1920); Etherton, *In the Heart of Asia* (1925); Skrine, *Chinese Central Asia* (1926).

Turkey. *Area.*—The national territories of the Republic of Turkey are defined by the Treaty of Lausanne (24th July 1923) with the Western Powers, by that of Kars (16th October 1921) with the Soviet Federation as to the Caucasian frontier, and by that of Angora (June 1926) with Great Britain as to Mosul. Thereunder Turkey includes: (1) Eastern Thrace, within a line from the mouth of the river Resvaya to include Adrianople and a *tête de pont* on the western bank of the river Maritsa, down the Maritsa so as to include Dédéagach; (2) Constantinople and the Straits, with Imbros and Tenedos; (3) Asia Minor, within a line from the Black Sea, excluding Batum but including Kars and Ardahan, to the old Ottoman-Persian frontier and new frontiers with 'Iraq (Mesopotamia), excluding Mosul, and with Syria from the Tigris to the Gulf of Alexandretta. The total area is about 494,538 square miles.

Turkey in Europe is now only the Thracian Chersonese, an isthmus of low-lying littoral with small decayed ports, fertile but unfarmed uplands in the east, mountains with forests in the west. It has been almost depopulated by expulsions during the recent series of wars and by subsequent deportations under peace treaties. Turkey in Asia covers Asia Minor with its considerable coastal cities and cultivated areas round them; in the interior, tablelands long denuded and lately devastated by war, rising to mountain ranges rich in unexploited mineral resources and still forested in the north and south. The territory as a whole is rich in economic possibilities, but will have to be repopulated.

Population.—The population is estimated at as much as over 13,000,000 and as low as 7,000,000. War has reduced the Moslem population by probably not less than a million, while policy has reduced the Christians by probably twice as much. Estimates of the present proportions of the various races are scarcely reliable enough to reproduce. But it may be safely stated that the indigenous Greeks in Thrace, Pontus, and Anatolia, and the indigenous Armenians of greater and lesser Armenia no longer exist as racial factors, while the Kurds, the only race that still shares this territory with the Turks, have been much reduced. In Constantinople there is still a considerable Greek, Armenian, and Jewish element—though all these and the foreign colonies in that city are much reduced and still declining. In fact the first stage of converting this territory from one shared between several races into a national territory of the Turks has been rapidly traversed. The Turkish race, though of Mongolian origin, has, by long miscegenation with Caucasians and Europeans and with the indigenous Greeks, Armenians, and Phrygians of Asia Minor, acquired the type and temperament of an East European community. Now that its oriental colour, its Levantine corruption, and its Byzantine constitution are all disappearing it is emerging as a 'white' race of essentially European mentality and type.

Government.—The present republican constitution is based on the 'Fundamental Law' voted by the Grand National Assembly of Angora, 20th January 1921, which vested all sovereignty in the people and all executive authority in the Assembly. The Assembly was elected for two years, the government being entrusted to commissars (vekil). A new constitutional law of 20th April 1924 declared Turkey a republic, and remodelled the constitution on rather more conventional lines. Executive power is still vested nominally in the Assembly, but is exercised through an elected president and a council of ministers appointed by him. The president's term of office coincides with that of the Assembly, over which he presides, both being elected for four years and re-eligible. He takes no part in debate, and has no powers of veto or dissolution. The present president being Ghazi Mustafa Kemal, the hero of the national renascence, his personal power is very great, and he has been able to suppress all opposition in the Assembly.

The only surviving restriction on Turkish sovereignty is the demilitarisation of zones on the western frontier and on the Straits, under the Treaty of Lausanne and its annexed conventions; which, however, does not exclude the right of garrisoning Constantinople. The autonomous privileges of the 'millets,' or Christian communities, and the extra-territorial privileges of the foreign colonies in their judicial and commercial capitulations, were all finally abolished by the Treaty of Lausanne, after being first abolished by the Ottoman Porte in September 1914. The International Board of Health and foreign post-offices have similarly been abolished. Turkey merely undertook in return to engage European legal counsellors and medical advisers to assist in the work of reorganising the judicial and sanitary administrations.

Under the fundamental law Turkey is divided into sixty-two vilayets, subdivided into cazas, and again into nahiés. At the head of the vilayet is the vali—a sort of prefect—with an elected council;

the caza is a mere group of nahiés; the nahié is a commune with an elected council.

Religion.—The religion of the republic and of most of the people is Islam. But instead of these Moslems—Turkish, Arnaut, Kurd, Circassian, &c.—being a ruling class in the leading country within the Islamic State, as they were under the Ottoman khalifate until 1924, they are now members of a disestablished religious community under a republic of rationalist tendencies. The khalif, and the Ulema or superior priesthood, as well as the Dervishes or monastic orders, have all been suppressed (1926), and there remain only Imams or parish priests. The charitable foundations or Wakf, which included a large part of the land of the country, have been secularised. Similarly the political and judicial autonomies of the Christian communities (millet) have been suppressed; but they are not restricted in the exercise of their religions.

Justice.—The jurisprudence of the Ottoman empire was drawn from a variety of sources—the Sheriat or Islamic religious law and the canon law of the Christian communities, these being followed in matters of status, succession, &c.; the statute law, embodied in edicts of the sultan, and a variety of codes, mostly from French models, but including the Mejellé or civil code, a modernisation of Islamic principles, these being followed in matters civil and criminal; the laws of the foreign colonies, applicable in civil and criminal matters as between foreigners under the capitulations. For the administration of this motley jurisprudence there was a medley of religious courts (Islamic and Christian), Ottoman courts, Mixed Tribunals for Ottomans and foreigners, and Consular Courts for foreigners. This has all been swept away by the Turkish republic in virtue of the Treaty of Lausanne. New civil, criminal, and commercial codes and codes of procedure have been introduced which are of wholly European origin. The Sheri courts have been abolished (8th April 1924), as have the Christian, Consular, and Mixed courts. The present system is simplicity itself, consisting of *Juges de paix* sitting singly, with limited but summary criminal and civil jurisdiction; *Tribunaux de base* of a president and two assessors with wider powers; and *Cours d'assise* of president and four assessors. There is no appeal, but a Court of Cassation. In recent crises special courts have been constituted. The Ottoman system of jurisprudence and judicatures is still maintained in the mandated territories of 'Iraq, Palestine, and Syria, where it is being slowly moulded to modern and local requirements.

Education.—Elementary education is in principle obligatory from the age of 7 to 16, under the law of 6th October 1913. Denominational schools, Islamic and other, were abolished by the law of 3d March 1924. There are primary, secondary, 'preparatory,' and some high schools (lycées); also some training schools and technical schools, and a University of Constantinople (founded in 1900), with many women students. The schools of the foreign communities—among which are notable the American (Robert) college for boys and another for girls—are subject to supervision by the Ministry of Education.

Language, &c.—The official language is Turkish. It is still generally written in Arabic script, but in 1926 the Latin character was adopted for official correspondence. Turkish is an agglutinative Turanian language akin to Hungarian. The metric system of weights and measures, introduced in 1889 and generally imposed in 1915, has not yet wholly superseded local systems. The confusion of calendars has been somewhat simplified by adoption of the Gregorian calendar from 1st January 1926 (1342 in the Hegira calendar).

Productions, &c.—(1) Agriculture is still the principal industry, and as yet primitive, though modern machinery is now not unknown. Its products are tobacco (Samsun and Smyrna), mohair, figs, silk, olives (Aidin), skins and hides, wool, gums, and opium (Konia and Kara-hissar). About seventeen million acres are under forest. There were in 1926 over twelve million sheep, ten million goats, five million cattle, one million asses and mules, and half a million horses.

(2) Mineral resources are still little exploited. There is chrome, silver, zinc, manganese, copper, borax, meerschaum, emery, asphalt, coal, lignite, salt, mercury, arsenic, and iron—mostly in central Anatolia.

(3) Industries are still undeveloped, and have suffered from the destruction of Smyrna in 1923 and the deportation of Greeks and Armenians. Carpet-weaving is little above half pre-war production; fig-packing, one-third. Efforts are being made to restart cotton-spinning and to start sugar factories. Sixty new factories of different kinds have been built since 1923.

Commerce.—Imports in 1924 were in millions of pounds Turkish, £T194, and in 1925 £T242, while exports for the same years were £T159 and £T193. The chief imports were cotton goods, £T74; cereals, £T22; metals, £T21; colonial goods, £T20; woollens, £T17. The principal importers in order were: Italy, £T43; Great Britain, £T37; Germany, £T27; France, £T26; United States, £T19. Exporters: Italy, £T50; Germany, £T17; United States, £T25; France, £T24; Great Britain, £T17. Trade with Great Britain shows a steady decline since the foundation of the republic.

Railways, Shipping.—The railway mileage (1926) was 2173. The Oriental railway (208 m.) connects Constantinople with Adrianople and Europe. The Anatolian railway (643 m.) connects Constantinople with Angora and Konia. The Bagdad railway (393 m.) continues from Konia to Nisibin in 'Iraq. There are also Smyrna-Aidin (376 m.), Smyrna-Kassaba (440 m.), and Mudania-Brusa (26 m.) railways. Under construction are Samsun-Sivas, Sivas-Angora, Samsun-Diarbekr, Trebizond-Erzerum, &c. There were in 1925 139 vessels of 129,443 tons under the Turkish merchant flag.

Defence.—During the campaigns of 1922 the national army reached a maximum strength of 200,000. On a peace footing it musters 120,000, composed of two classes of conscripts—men aged 22 and 23. It is organised in nine army corps—eighteen infantry and three cavalry divisions. It is relatively well disciplined and equipped. The navy is under reorganisation and will comprise the battle-cruiser *Yavouz* (*Goeben*), an old battle-ship *Tourgout Reis*, the light cruisers *Hamidieh* and *Medjidieh*, eight gunboats, three destroyers, and six torpedo boats, all old. The air service is still in embryo.

Finance.—The finance of the Ottoman empire was for the most part controlled by a foreign receivership—the Council of the Debt—under the Decree of Mouharrem (20th December 1881) in the interests of the foreign bondholders. The Turkish republic has, however, not maintained this system, in spite of foreign protests, and continues to appropriate the revenues assigned to service of the debt under the Ottoman empire. The debt was, by the Treaty of Lausanne, apportioned among the succession states, Turkey being charged with 62·25 per cent. of debt incurred prior to October 1912 and 76·54 per cent. of subsequent debt. The total Turkish debt is £T82,000,000 and the annual budget charge about £T10,000,000. The other more important items of budget expenditure (in £T millions) are: defence 58; finance, pensions, &c. 27; public works 22; police 9; education 6;

health 3; public security 4; refugees 2·6. The budget, previously in deficit, is balanced for 1927–28 at revenue £T189 millions; expenditure £T188·7 millions. Revenue is raised from land, property, income and profits, consumption, live-stock, monopolies, customs, &c. The Imperial Ottoman Bank has been gradually replaced as government bank (1917–26) by the Ottoman National Credit Bank, with a capital of £T4,000,000. The metal currency is on a gold standard with the piastre as unit, subdivided into 40 paras; 100 piastres = £T1 (one Turkish pound), and £T11 = £10. The paper currency was depreciated to about 12 per cent. of its nominal value, but the issue of a new currency was begun in 1927.

History.—The Osmânlîs or Ottoman Turks, who trace their descent from a small clan of the Ouighours, were pressed forward from their old camping-ground in Khorâsân by the advance of the Mongols, and, coming to Armenia early in the 13th century, were fortunate enough to assist the Seljûk sultan of Iconium at a critical moment in his resistance to the Mongol avalanche, for which service they were rewarded with lands in Asia Minor. Ertoghrul, the leader of the 400 horsemen who had thus come to the rescue of the Seljûks at the battle of Angora, was allowed to pasture his flocks and pitch his tents in the province anciently known as Phrygia Epictetus (thereafter called Sultanöni), on the borders of the Byzantine province of Bithynia, and made the city of Sugut (Thebasion) his headquarters. When in the 14th century the Seljûk sultanate disintegrated it was replaced by an Ottoman sultanate, so called from the European corruption of Osmân or Othmân, son of Ertoghrul, born at Sugut in 1258. Osmân may be considered the first of the long line of thirty-five Ottoman sultans which may be conveniently classified as follows: Five great sultans who built up the empire in Asia, the fifth being Mohammed I., the Restorer (1413–21), after the irruption of Tîmûr; five even greater sultans who built up the empire in Europe, ending with Suleiman the Magnificent (1520–66); twenty unimportant sultans, of whom ten covered the period of the Ottoman dominance up to the second siege of Vienna (1683), and ten the period of decline ending with Mahmud the Reformer, 1808–39; five sultans of the reconstructed empire ending with Abdul-Hamîd II., the Damned, 1876–1908. The two sultans that followed the revolution (1908) do not count. Osmân, who reigned from 1301 to 1326, waged a guerilla war on the Byzantine empire, captured many fortresses, pushed his conquests to the verge of the Hellespont, and took Brusa the capital of Bithynia. His son, Orkhân (1326–59), reduced Nicæa (1330) and Mysia (1336). Thus in two generations the little clan of nomads had possessed themselves of the whole north-west corner of Asia Minor, and obtained the command of the eastern shores of the Bosphorus and Propontis. It was Orkhân and his brother, 'Alâ-eddîn, who organised the State, and created the famous corps of janizaries (*Yeni cheri*, 'new soldiery') recruited from Christian children, educated as Moslems, and carefully trained and disciplined. Deprived of all ties of kinship, but encouraged by every inducement to zeal and devotedness, this brotherhood became one of the most devoted and most fanatical instruments of imperial ambition ever devised. Later, their peculiar recruitment having become obsolete, this military corps and civil service degenerated into a business corporation, without military or civil value and with every social vice. So that their suppression became as indispensable as that of their confrères the Mamelukes in Egypt with which it was almost contemporary (1826) (See JANIZARIES, MAMELUKES.) Besides these professional soldiers and civil servants, the Turks developed out of their primitive tribal and class organisation a very efficient feudal system under bairakdars and timariots. Their government as a whole compared so favourably with the corrupt and cruel régime of the Byzantine empire and Ottoman efficiency and economy was such a contrast to Byzantine extortion and extravagance that even the Greek cities and communities of Asia Minor welcomed conquest by the Turks. While Constantinople itself for long before its final conquest was tributary to the Turks, and was defended by Turkish corps of 'Gasmouls' and 'Turcopouls.'

Nevertheless such was the prestige of Constantinople and such the predominance of Greek civilisation in the Near East that the Ottoman empire would never have replaced or, rather, revitalised the Byzantine empire but for the overthrow of the Greeks by the Latin capture of Constantinople in the fourth crusade (1203). The revived Greek empire of Paleologoi and Cantacuzenoi was a feeble affair. Even so the Turks only attempted its final overthrow after it had been isolated for years.

In 1358 the Turks took Gallipoli, and a few years later Adrianople and Philippopolis. Murâd I.—the first 'Amurath' of European writers (1359–89)—in 1364 decisively routed the united Serbians, Hungarians, and Vlachs on the banks of the Maritsa. In 1375 he received the homage of the despot of Serbia and of the kral of Bulgaria. The Balkan Peninsula was thereafter a Turkish possession, with the exception of the territory immediately surrounding Constantinople. Twice again the Christians endeavoured to turn back the wave of Moslem conquest. Lazarus the Serbian in 1389 led a great army against the Turks, but was severely defeated in the battle of Kossovo, followed by the assassination of Murâd I. by the Serbian Milosh Kobilovich. His successor, Bayezîd I. (Bajazet, 1389–1402), surnamed *Yilderim*, or 'Thunderbolt,' annexed the remainder of the Seljûkian states of Asia Minor, and established the Ottoman power in Europe at Nikopolis (1396). The invasion of Tîmûr (Tamerlane) interrupted the victorious course of the Ottoman arms, then, apparently, on the eve of the capture of Constantinople. The Tatar hordes overran Asia Minor, and totally defeated the Turks near Angora, in 1402. The sultan was taken prisoner, and died in captivity eight months later. Tîmûr reinstated the Seljûk principalities in Asia Minor and the Christian principalities of Eastern Europe, and the Ottoman empire seemed to have found an early end. But the vitality of its civil and military system and the vigour of its new sultan, Mohammed I., the Restorer (1413–21), had soon rehabilitated it. The capital was transferred from Brusa to Adrianople, which in a few years quite outshone the isolated and decadent Constantinople. Under the next sultan, Murâd II. (1421–51), the Turks successfully staved off a strong counter-attack of the Balkan Christians led by the Hungarians under Hunyadi, which for a time recovered Serbia and Wallachia under the Treaty of Szegedin (1443). But a decisive defeat of the Christians at Varna (1444) definitely decided Ottoman domination in Eastern Europe.

Murâd's long reign of thirty years was glorious, and this sultan was as virtuous as victorious. Murâd's successor, Mohammed II., the Conqueror (1451–81), reigned also thirty years, but he was as cruel and unscrupulous as he was conspicuously able. The great event of his reign was the siege and capture of Constantinople (29th May 1453), whereby the miserable remnant of the Byzantine empire was extinguished for ever, and the Turks obtained that commanding position on the Bosphorus which has contributed more than anything else,

directly and indirectly, to the maintenance of their empire. In the north the progress of Ottoman conquest was arrested by the heroic defence of Belgrade in 1456 by Hunyadi and John Capistran, and by the subsequent resistance of Hunyadi's successor, Matthias Corvinus. In the west Scanderbeg for a while kept the Turks back in Albania. But they conquered the Crimea (1475) and even menaced Venice (1477) and Rhodes. They annexed Greece and most of the Ægean islands, and later planted their foot on Italian soil by the capture of Otranto in 1480. The long reign of Mohammed's son, Bayezîd II. (1481–1512), was marked by no great conquests. But Bayezîd's son, Selîm I., the Grim (1512–20), incorporated Kurdistân and Diarbekr in the Turkish empire, annexed Syria and Egypt, overthrowing the Mamelukes and ousting the last Abbasid khalif. The title of khalif, the relics of the Prophet, and the possession of the Holy Cities secured to the Ottoman sultan the hegemony of the Islamic State and the headship of the Moslem world. Under Selîm's son, Suleiman the Magnificent, the Ottoman empire, by virtue of Constantinople the culture centre and commercial capital of the Near East—of the khalifate the governmental sanction of Islam—of conquest over Greeks and Latins—and of a civil government that was the envy of Europe, reached its apogee. Suleiman conquered Belgrade, and, after a heroic siege, reduced (1522) the rocky stronghold of the Knights of St John at Rhodes. In 1526 the sultan crushed the Hungarians on the field of Mohács. Buda and Pesth fell, and Hungary became an Ottoman province for a century and a half. In 1529, after laying the country waste, the sultan attacked Vienna, which withstood a furious siege for eighteen days. Eight years later Suleiman led his ninth campaign in the north, and compelled the emperor to sue for peace, the Archduke Ferdinand agreeing to pay a heavy tribute to his lord the sultan, who retained the whole of Hungary and Transylvania. Suleiman can claim to be 'The Magnificent' in an age of magnificence like that of Charles V., Henry VIII., Francis I., and Leo X. Splendour was a new achievement of the Turks, and not without its dangers. A less dangerous development was the new Ottoman sea-power. In the age of Doria and Drake the Turkish admirals Dragut and Barbarossa commanded the Mediterranean, drove the Spaniards from the Barbary States, and defeated the fleets of pope, emperor, and doge at Prevesa (1538). Another experiment that proved less successful was that Suleiman married and made Roxelana empress. Her intrigues in favour of her own sons caused the deaths of several suitable successors, and dealt the first and a deadly blow to the empire by bringing to the throne Selîm the Sot (1566–74).

In Selîm's name Sinân Pasha subdued Arabia in 1570, and Cyprus was conquered in 1571; but these successes were outweighed by the utter defeat of the Turkish fleet by Don John of Austria, 7th October 1571, off Lepanto, which first broke the spell of Turkish prestige at sea. During this reign occurred the first collision of the Turks with the Russians. The connection of the Don and Volga by a canal was a useful project involving the possession of Astrakhan; but the Turks were heavily defeated in an attack on that town, and the project was abandoned. On the other hand, Tunis was taken from the Spaniards in 1574. The reign of Selîm's son, Murâd III. (1574–95), is chiefly notable for the reception of the first English embassy to Turkey in 1589, sent by Elizabeth to seek an alliance against Philip II. of Spain. Georgia was conquered from Persia in the east, and on the Danube war was waged with varying success, with Turkish prestige generally on the wane. Of the succeeding sultans Murâd IV. (1623–40) alone revived prestige in campaigns against Persia and in the conquest of Bagdad (1638). Later and lastly, Crete and the Venetian islands were annexed (1645). But the empire, though still forceful at the circumference, was already feeble at the centre. Palace government and seraglio intrigues had replaced the personal autocracy and the professional civil service. The army was still formidable, and justice not yet corrupt; but the Byzantine poison had already done its deadly work on the sound system of the Ottoman régime. It was found necessary to have recourse to the governing talents of the rayah races—especially of Greeks and of Moslemised Europeans. The Köpreli family, as viziers, carried the empire through the critical period of the first serious defeats on the European frontier by John Sobieski. Defeats at Choczim (1673), Lemberg (1674), Vienna (1682), Mohács (1686), and Zenta (1697), followed by the treaties of Karlowitz (1699), and Passarowitz (1718), ended Ottoman rule over Hungary, Transylvania, and Podolia, while the Venetians conquered the Peloponnese and bombarded Athens. The Turkish tide had turned to the ebb.

The long chapter of Russian ambitions and aggressions begins with the 18th century. The invasion of Moldavia (1711) by Peter the Great was disastrous, but the Russian advance was renewed with the seizure of Azov and Oczakov (1736). The Morea was recovered (1715), and Belgrade lost and won again (1730–54). Campaigns against Austria and Russia, sometimes in coalition, continued throughout the century, until the French revolution turned the attention of these empires westward. The Treaty of Jassy (1792), confirming the Treaty of Kainarji (1774), fixed the empire's boundaries at the Sawa, the Dniester, and the Black Sea, and terminated Anglo-Russian schemes for a restoration of the Greek empire and Austro-Russian schemes for partition of the Ottoman empire.

Selîm III. (1789–1807) profited by the respite to try a reform of the empire. But the attempt to repress the janizaries and feudatories cost him his life. The French invasion of Egypt brought Turkey into alliance with Great Britain, and gave British policy its traditional trend towards reforming and reinforcing the Ottoman empire as the best means of preventing an occupation of Constantinople by one of its rivals—especially Russia. Mahmud II., the Reformer, after an initial failure that would have cost him his life had there been any other male heir, succeeded in reconstructing the empire, and in reducing first the Greeks, who had monopolised its administration, and then the janizaries to impotence by massacres *en masse*. On the other hand his effort to crush the new Greek nationalist movement in the Morea, in alliance with a new oriental military power, Egypt, was frustrated by the Powers at Navarino (1827). Another war with Russia brought a Russian army to the walls of Constantinople, and a series of wars with Egypt brought an Egyptian army to the Straits. On both occasions the empire was saved by the jealousies of the great Powers, and principally by British sea-power. Its administration, which during the Napoleonic epoch had been under French influence, came very much under British influence as exercised by Stratford Canning, the Great Elchi. The end of Mahmud's reign found Algiers a French protectorate (1830), Greece a new nationalist state (1828), Egypt *de facto* the same, Albania, Arabia, Serbia, and Wallachia all well on the road to independence. Abdul-Mejîd (1839–61), under British guidance, inaugurated constitutional reforms on paper (the Tanzimat), and endeavoured

to counter the Russian claim to protect Ottoman Christians, by a policy of religious and racial equality intolerable to the Turkish ruling race and incompatible with the system of the Islamic State. Russian imperialism, convinced of the hopeless decadence of the empire, and failing to detach the British from its support by proposals for partition of the 'Sick Man's' estates, came into collision with Great Britain, France, and Turkey in the Crimean war (1853–55). The Treaty of Paris (1856) restored to Turkey the command of both sides of the lower Danube, excluded the tsar from his assumed protectorate over the Danubian principalities, and closed the Black Sea against all ships of war. In return, under pressure of British policy, proclamation was made (Hatti-Humayun) of the equality of all races and religions and the establishment of general civil rights and governmental reforms. Any chance this policy may have had was cancelled by the reckless recourse of the Palace to the resources of European credit opened to the reformed empire. Senseless extravagance and cynical corruption accumulated a burden of unprofitable debt, whose charges crushed the contributor, and whose growth made bankruptcy and a foreign financial control inevitable when repudiation was reached in 1875. Consequently Islamic intolerance and Turkish independence were alike in revolt against a régime so provocative of both ideals. While the nationalist movements of Eastern Europe relentlessly pursued their course, massacre of Christians in Lebanon and at Damascus provoked western intervention in 1860. The nominally subject peoples of Moldavia and Wallachia ventured to unite themselves into the one state of Rumania; and in 1866 the empire, becoming more and more enfeebled through its corrupt administration, had to look on while the Rumanians expelled their ruler, and, in the hope of securing western support, chose Prince Charles of Hohenzollern to be hereditary prince of the united principalities. The rebellion of Crete in 1866 was ultimately suppressed in 1868, but Serbia, already autonomous within her own frontiers, demanded the removal of the Turkish garrisons still maintained in certain Serbian fortresses; and in 1867 Turkey saw herself compelled to make this concession. Egypt bought its formal release from all but the most shadowy suzerainty, and the sultan, refusing any more dignified or definite title to its pasha, accorded Ismail the Persian title of Khedive (q.v.). The 'integrity of the Ottoman empire' secured by the Treaty of Paris at the cost of the Crimean war, was the integrity of snow in summer, and the treaty itself was badly torn when Russia profited by the war between France and Germany to repudiate the restriction on its naval armaments in the Black Sea. In the early 'seventies the empire, menaced by Russian invasion and by foreign financial control, had to face the outbreak of insurrection among the Serbs and Bulgars. The Bulgar rising was repressed by brutalities that, exploited by the eloquence of Mr Gladstone in the Midlothian campaign, detached the majority of the British electorate from its traditional policy of supporting Turkey. Abdul-Azîz (1861–75), whose extravagance had brought the empire to ruin, was deposed by a *coup d'état* of the army; and his nephew, Murâd V., son of Abdul-Mejîd, who succeeded him, was destined in turn to make way for his brother, Abdul-Hamîd II., in August of the same year. In June Serbia declared war, and Montenegro followed her example. Before the end of the year the Serbians were utterly defeated, in spite of the help of many Russian volunteers; but the state of affairs in the Turkish provinces seemed to call for a conference of the Great Powers at Constantinople. The proposals then made for the better government of the Christian subjects of Turkey were rejected by Abdul-Hamîd, who, posing as a reformer, effectively choked the conference cat with constitutional cream by proclaiming parliamentary government for the whole empire in the constitution of 1876. The conference, checkmated, dispersed, and Abdul-Hamîd closed the chambers. Russia then assumed the task of imposing the reform proposals of the Powers on the sultan, and declared war (1877). Both in Armenia and Bulgaria the opening of the campaign was favourable to Russian arms, but later the Turks rallied and seriously checked the triumphant progress of the invaders. Even after the Russian forces had been greatly augmented the Turks resisted energetically. Kars, besieged for several months, held out till the middle of November; Erzerûm did not surrender until after the armistice had been concluded. Osmân Pasha, who established himself in Plevna early in July, repelled with brilliant success repeated and determined assaults from a besieging army of Russians and Rumanians until the 10th December, when he surrendered. Desperate fighting in the Shipka Pass had moreover failed to expel the Russians from their position in the Balkans. The victorious Muscovites occupied Adrianople in January 1878; in March the 'preliminary treaty' of San Stefano was signed, by which the greater part of Roumelia, including Macedonia, was assigned to a greater Bulgaria under Russian protection. Constantinople, the Tsargrad of the Slavs, seemed about to become the southern capital of a great north and south Slav federation. But such a settlement of the eastern question was a challenge to the traditional foreign policy of Great Britain that British imperialism, then in its first youth under the imaginative inspiration of Disraeli, could not brook. Jingoism was born of the crisis with its music-hall refrain of 'Russians shall not have Constantinople.' The British fleet appeared off San Stefano. The treaty was referred to an international congress at Berlin, which eventually settled the eastern question for a generation in the Treaty of Berlin (1878). Therein the imperialist ambitions of the Powers were met at some cost to the nationalist aspirations of the Balkan peoples. Thus the independence of Serbia and Rumania was recognised, but Rumanian Bessarabia was acquired by Russia, and Serb Bosnia and Hercégovina were put under Austrian tutelage. Bulgaria had to give back Macedonia to the empire and accept Ottoman suzerainty over eastern Roumelia. Greece was to have Thessaly, but not Greek Macedonia, Crete, or Epirus. All of these frustrations of nationalism in favour of imperialism were in due course corrected by circumstances, though some only in recent years. In return for this rehabilitation the Ottoman empire once more pledged itself to introduce internal reforms. Disraeli, however, with characteristic cynicism, had, before the congress, concluded a secret convention, taking Cyprus in pledge for the execution of this promise. Abdul-Hamîd probably considered a Greek island a cheap price to pay for being rid of Anglo-Saxon altruism, for the scheme of reforms exhaustively elaborated for Roumelia was pigeonholed, while those for Anatolia were never even put on paper. The Turkish reforming statesman, Midhat, was exiled on a false charge of having murdered Abdul-Azîz and was done to death in Arabia, his constitution was finally suspended, and the empire entered on its last phase of government by palace camarilla and espionage. By playing off one Great Power and one Balkan people against another, Abdul-Hamîd managed for a time to keep in check both imperialist and nationalist menaces in Europe and Asia; but not daring to organise a fleet lest it lead a revolt, he lost the African pro-

vinces. France annexed Tunis in 1881, and in 1882 Great Britain occupied Egypt. But his method of dealing with the Armenian nationalist aspirations, which won him the title of the 'Red Sultan,' are now seen in the light of later and even more lurid massacres to have been not personal to himself but a phase in the conflict between Turks and Armenians for a national territory in Anatolia. For after the special engagements entered into by the British in the Treaty of Berlin the Armenians considered it safe to take their turn in the eastward extension of the nationalist movement. But there was to be no Navarino or Shipka for the Armenians. As Lord Salisbury observed, 'The British fleet cannot cross the Taurus'; while Russia, which had fought for the south Slavs, and already regretted it, considered that its hold on the Caucasus would be endangered by the establishment of a national state in its neighbourhood. The Armenians were accordingly left to their fate. When in 1894 Turks and Kurds began massacring Armenians at Sassun and in 1895–96 throughout Asia Minor, the protests of the Western Powers only exposed their impotence; while Tsarism was undoubtedly an accomplice. Finally a 'frame up' by Russian Armenians, who seized the Ottoman Bank in Pera and then were allowed to escape, prepared foreign opinion for a massacre at Constantinople. And though the 'butchers' bill' of these massacres, about a quarter of a million, was small compared to that of massacres by Young Turks during the Great War, the impression was far greater. Thereafter the British left the policy of maintaining and modernising the Ottoman empire to the Germans, and tended to favour partition. So when Greek nationalist expansion in Crete (1897) caused a war with Turkey in Thessaly and disastrous Greek defeats, Greece was saved from dismemberment by the Powers and got off with a small war indemnity of four million; while in spite of this defeat Crete obtained, under the high commissionership of Prince George, an autonomy which was obviously only an antechamber to an assimilation with Greece. Meantime the restlessness of the Arabs and Arnauts was causing repeated guerilla in the Yemen and in Albania. But the real focus of nationalist forces and of imperialist frictions was Macedonia. For this province excited the land-hunger of all the neighbouring new nationalist states, and was honeycombed with their secret conspiracies and campaigns. While the eastward pressure of the Austrian empire and the southerly penetration of the Russian empire there found both an objective and an impact. At last the ceaseless guerilla of the Macedonia 'Tcheti,' of Wallachs, Arnauts, Greeks, Serbs, and Bulgars, campaigning for their respective national causes, and the increasing risk that this guerilla would lead to a Balkan war between their natural protectors, and that again to a European war between their imperial patrons, compelled an expression of pacificist public opinion through the concert of Europe. A whole series of arrangements and agreements, of which the most important was the Mürzsteg programme, was attempted with a view to pacifying Macedonia under international police. And the steady growth of this intervention was viewed with increasing indignation by the Turks, whose inarticulate inertia under the evils of Hamidianism had caused the Powers to form much too low an estimate of their surviving vitality. It was the meeting between King Edward and the tsar at Reval in 1908, interpreted in Turkey as the prelude to an Anglo-Russian partition, that created a coalition of all the still forcible factors among the Turks for such a reconstruction of the empire as would give it a new lease of life; since it was clear that the diplomacy and despotism of Abdul-Hamîd were now ruinous to the empire's interests. But there was no open opportunity for reform—because since 1876 the Turkish reformers had been driven underground or overseas. There were, however, two strong currents for reform, one filtering underground through the secret organisation of the Bektashi dervishes and professing a curious combination of French modernism and Islamic mysticism, the other being the organisations of Young Turks in Paris with rationalist and republican programmes. Both these movements were helpless against the sultan's government by espionage so long as the army remained loyal to him as padishah and khalif. But when the Young Turkish officers, educated at the Pankaldi school and in foreign missions, recognised that essential military reforms were only realisable through revolt, the revolution became practicable. The 'Committee of Union and Progress' established itself in Salonika in 1906, and within two years had secretly and successfully organised the Macedonian military revolt of July 1908. Hamidianism in Macedonia had three supports—the garrisons of Anatolian Turks, who as Moslems hated all Christians; the Albanians, who as Bekjis (village watchmen) and brigands 'policed' Macedonia; and the 'Tcheti,' or professional propagandists of the rival Christian races, who hated and harrassed one another even more than they did the Turks. The programme of the Committee did at first provide a common ground upon which all these rivals could fraternise in revolt against an odious governmental system. The Albanians had been alienated by the sultan's attacks on their tribal liberties and license; the Christians were ready to ally themselves with their enemies for the overthrow of Abdul the Damned; while an appeal to the Turkish troops to rise in defence of Islam against Western intrusion obscured in their simple minds the fact that they were mutinying against their padishah. Bodies of Turkish troops marching from Monastir through the highlands of Macedonia under Niazi and Enver, after deposing their superior officers, were acclaimed everywhere by the Christians. The constitution of 1876 was proclaimed (23d July) at Ferizovitch on the Albanian border and accepted the following day by the sultan, who always knew when he was beaten. As usual on such occasions there ensued a millennial fraternisation of all races, rivals, and religions that so impressed the foreign Powers that they too accepted the revolution as a permanent reconstruction, instead of what it was—merely a preliminary repudiation of Hamidianism. And this had a first effect favourable to the Young Turks in that it terminated any arrangements for internationalising Macedonia. The further effects were less favourable in that all those governments who had claims, either nationalist or imperialist, on the 'Sick Man's' inheritance, began to try to cash what they could of those claims while they could. Thus Austria annexed the hitherto 'protected' states of Bosnia and Hercegovina; and Bulgaria, with Austrian approval, denounced Ottoman sovereignty and declared itself a kingdom (Oct. 1908). The Young Turks retaliated spiritedly with a trade boycott, but had to be content with indemnities.

The policy of the Young Turk Committee was at first to remain at Salonika and thence enforce reconstruction, leaving the actual execution to the parliament at Constantinople. Accordingly, a protégé of the British, the aged Kiamil Pasha, was allowed to form a 'Liberal' government, with a programme of reconstruction on a federal basis with local autonomies. Such a policy was very satisfactory to the subject-races represented in the Liberal party, but very suspect to the Turko-Jew Radicals of the Committee, who saw in a centralised and corporate empire the only escape from a renewal of disintegration or a relapse into despotism. Already

reaction was active in the form of the Mohammedi Conservatives, who were organising an opposition of Hodjas, Softas, and Moslems generally against a reconstruction, and in favour of a restoration of Hamidianism; which conflict between the Liberal chamber and the Radical Committee represented a rivalry between the British and German patrons of the revolution. For the revolution had restored to the British that paramountcy in the empire that they had lost to the Germans. Kaiser Wilhelm II. had personally promoted various enterprises—for example, the Bagdad (q.v.) railway—which had made Germany predominant, both politically and economically. Turkey in Europe had become an Austrian sphere of influence, Turkey in Asia a Prussian protectorate. The Turkish army was managed by German officers, and the country was becoming mortgaged to German bankers. This German control was threatened by the overthrow of Abdul-Hamîd. But the British, supposing that the Liberals represented in Turkey the moderate masses, and seeing in federalism the best basis of reconstruction, came into opposition with the Committee, who after the elections of 1908 had come into conflict with the federalists. The Committee then decided to assert their authority, and appointed as vizier their own associate, Hilmi, thus assuming the responsibility for ruling the empire; which conjuncture Abdul-Hamîd considered favourable for a reactionary *coup d'état*. His agents among the Softas had succeeded in seducing from their allegiance to the Committee the Macedonian regiments that had been sent to garrison Constantinople. The cry of these mutineers was 'the Sultan and the Sheriat,' but palace gold had contributed considerably to their reactionary fanaticism. They murdered many of their Young Turk officers, invaded parliament, and proclaimed the constitution at an end. As this reaction found considerable support in Great Britain, it enabled Germany to recover its influence by establishing close co-operation with the Committee for the restoration of the constitution. A revolutionary army under Mahmud Shefket—the 'Army of Liberty'—was transported from Salonika to Constantinople with surprising expedition, and overcame the resistance of the reactionary regiments with no less surprising ease (April 1909). Abdul-Hamîd was deposed, and despatched into exile at Salonika. Thereafter the Committee took no more chances with constitutional government. Mohamed Reshad, Abdul-Hamîd's long-suffering brother, was proclaimed sultan as Mohamed V., but there was never any question of his being allowed to rule. The Committee transferred their organisation to Constantinople, and made no further concealment of their being the real rulers. The revolution that had started as a reconstruction of the Ottoman empire was thus rapidly converted into a renascence of the Turkish race, and, as such, was bound to come into collision with the other races of the empire. And hardly had the Young Turks dealt with reaction than they were faced with another raid from abroad. On the flimsiest of pretexts an Italian army seized Benghazi, and Tripoli was annexed to Italy. A desultory warfare, disgraced by great cruelty, dragged on in the interior between the Italians and the Senussi (q.v.), the latter ably assisted by Enver and other Turks, until the outbreak of the Balkan wars caused a peace to be patched up in the (first) Treaty of Lausanne (1912). Although the Powers were successful in insulating this Turco-Italian war in Africa, yet it necessarily contributed to breaking up the superficial coalition of races and religions in the Young Turk revolution. There was probably never any real possibility at this period of Moslem and rayah working together as Ottoman citizens in a reconstructed constitutional empire. For the subject-races of the Ottoman empire were in too close contact with their kinsmen in the neighbouring nations, while the Turks were too much imbued with the temperament of a ruling class and with the traditions of Moslem authority to accept a position of equality with the subject-races. Among the Balkan nations negotiations for a coalition against Turkey and a partition of the European provinces had begun as early as 1910. Even so, the race-hatred between Slavs and Greeks would have prevented any effective coalition but for the centralising and coercive policy of the Young Turks. Even more intolerant of any federal freedom than Abdul-Hamîd himself, they soon found themselves at war with the tribal liberties of Albania and of Arabia. Nor were they any more tolerant of the efforts of the Ottoman Greeks to exploit Greek political talents for getting control of the parliamentary machine. The Committee's efforts to arrange the elections antagonised all factions; and, most fatal of all, they temporarily lost control of the army. They were succeeded (June 1912) by a ministry of Old Turks, with a policy of general pacification which the Committee tried to combat by provocation of every kind. The Young Turks began to work for war. One of them, who was envoy in Montenegro, even presented an unauthorised ultimatum. As, in the course of the previous year, the Balkan States had arranged their military coalition for a partition of European Turkey, war was very shortly declared against the empire by Greece, Bulgaria, Serbia, and Montenegro, all supported by Russia. And as the Turkish revolution had not had time to reconstruct the army, as the measures that it had taken, like the admission of Christians to its ranks, had only tended to disorganise and demoralise it further, and as the position in Macedonia was one of great strategic weakness, the collapse of the Turkish resistance in that province under the converging attack of Greeks, Serbs, and Bulgars was inevitable. It was not long before the Turkish troops were everywhere defeated in open field and driven from one stronghold to another, their most remote refuges, Yanina and Scutari, not being captured until the spring of 1913. In Thrace the Bulgar armies marching on Constantinople drove the Turks before them behind the lines of Chatalja. But the Bulgars could not carry the defences of the capital by a *coup de main*, and knew that Russia would not allow them to occupy it. Moreover their real political objective was not Constantinople but Salonika. So an armistice was concluded (25th Nov. 1912), and the Powers endeavoured to arrange peace terms. The Committee of Union and Progress was in favour of prosecuting the war, while the Old Turk ministry under Kiamil was pacific. This ministry decided (22d January 1913) to accept the Powers' proposals in respect of Thrace and the Ægean Islands. But on the following day the Committee effected a *coup d'état*, in the course of which Nazim, the minister of war, was shot. A triumvirate of Enver, Talaat, and Djemal then seized power, and Mahmud Shefket became grand vizier. Hostilities in Thrace were renewed; but the Turkish naval and military offensives were repulsed, and Adrianople surrendered (25th March). The Young Turks then themselves invited the mediation of the Powers, who summoned the belligerents to a conference in London and put before them terms of peace. These Bulgaria and Turkey were ready to accept; but Greece and Serbia, not being so exhausted and being engaged in entrenching themselves in Macedonia to the exclusion of Bulgaria, procrastinated. Under pressure from the British government the Treaty of London was at last signed

(13th May 1913), under which the boundary of the Ottoman empire in Europe was put back to a line across Thrace from Enos to Midia. In spite of this formal and fair settlement the second Balkan war then broke out in Macedonia in a dispute over its partition between a coalition of the Greeks and Serbs as against the Bulgars. This war only indirectly concerned the Turks in that it enabled the Committee to tear up the Treaty of London almost before the ink was dry. For the Bulgars, defeated in Macedonia and driven back upon Sofia, had withdrawn the bulk of their forces from their new territory in Thrace. In July the Turkish army under Enver re-occupied Adrianople, sweeping out not only the Bulgar garrisons but the whole indigenous Bulgar population. Bulgaria, after a vain appeal to the Powers to maintain the Treaty of London, made the best terms it could with Turkey in the Treaty of Constantinople (29th September), renouncing Thrace and Adrianople, and retaining only the coastal strip of western Thrace and Dédéagach. This victory of the Young Turk triumvirate—Enver, Talaat, and Djemal—which controlled Constantinople in 1913, implied a victory of German over British influence in the future policies of the empire. Which change coinciding as it did with the crisis of the Great War had consequences very formidable for Europe and fatal to the empire itself. Before the end of 1913 a German military mission was in executive control of the Turkish army, and a British naval mission in no way counterbalanced its influence. Moreover a military alliance was arranged between Germany and the Committee triumvirate early in 1914, and an outbreak of general war made a declaration of Turkey on the side of Germany inevitable unless the Committee were overthrown by a *coup d'état* and Constantinople overawed by a naval *coup de main*. When, however, early in August 1914 the German warships *Goeben* and *Breslau* evaded the British fleet and entered the Bosporus, the Committee had little difficulty in forcing their belligerent policy on the Ottoman cabinet and capital. Turkey's objective in entering the war against the Allies was the recovery of Egypt, which was supposed to be ready to rise against the British occupation. Preparations were made in Syria for the invasion of Egypt, and a claim to Egypt as an integral part of the Ottoman empire was formulated (2d October 1914). War was declared (5th November 1914), and Djemal himself led an army against the Suez Canal (January 1915). The attack on the canal was repulsed, and was followed by a British counter-stroke against Constantinople. But a bombardment of the Dardanelles defences in the autumn by the Allied fleet had led to such a fortifying of Gallipoli and the Straits that, defended by the flower of the Turkish army under German guidance, the assaults of the Allied forces, naval and military, proved unable to force the Straits. After a preliminary failure of the Allied fleets to pass the Straits early in March, the attempt being more nearly successful than was at the time supposed, large British and some French military forces landed on Gallipoli in April, and during May, June, and July of 1915 maintained assaults on the Turkish defences. By October the attempt had been abandoned, and during December the British forces were withdrawn. Owing partly to this failure and partly to the secret understanding between Great Britain and Russia as to the latter's right to annex Constantinople, confirmed in an agreement of 18th March 1915, the Greeks, and for a time the Rumanians, remained neutral, while Bulgaria joined the Central Powers. Thereafter the elimination of Serbia and the release of the Turkish forces from the defence of the Straits, led to a Turco-German offensive disastrous to the British campaign in Mesopotamia and disturbing to the Allied cause in Persia and Central Asia. The capitulation of Kut was the acme of the Turks advantage on this southern front; while on the northern front their campaigns against the Russian forces in the Armenian highlands were on the whole disadvantageous to them. But the Russian revolution and retirement in 1917 brought relief to the Turkish armies, thereby enabled to overrun Transcaucasia and even occupy the Caspian littoral north of the range. Meantime the Young Turks eliminated Armenian nationalism by mass massacres unprecedented in modern times. In the south, however, a general rising in Arabia and an advance into Syria of the British forces in Egypt drove the Turks out of Mesopotamia, Syria, Arabia, and the greater part of Palestine. By that time Turkey was entirely exhausted by its efforts and eager for peace at any price. The collapse of Bulgaria (August 1918) caused at once a complete capitulation on the part of Turkey in the armistice of Mudros. And in view of the secret treaties of partition between the Allies, concluded during the war, it looked as though not only the Ottoman empire would be dissolved, but that even the Turkish race would be disintegrated among Allied protectorates. However, the renunciation by the Russian revolutionaries of their rights over Constantinople, and the preoccupation of the Allied Powers with the resettlement of western Europe, gave the Turks a respite which that still vigorous race turned to great advantage. The Young Turk triumvirate and the C.U.P. had of course fallen and fled, their place being taken by anglophil and Old Turk ministries. Constantinople, though not at first formally occupied by the Allies, became a base for their operations against the Russian revolution, in the Ukraine, Transcaucasia, and Central Asia. Great Britain, now predominant, began to pursue a policy of substituting Greek power over the Straits and Ægean littoral in preference to the policy of partitioning the empire into protectorates under the Powers. This pro-Greek proclivity rapidly became a policy of using Greek military and naval forces against the growing resistance of the Turks to disintegration and subjection. Which resistance had found a leader in Mustafa Kemal, a Salonika soldier-reformer, whose services in the Army of Liberty in Gallipoli and in Asia Minor had made him a national hero, though he had been hitherto kept in the background by the triumvirate. When in May 1919 Greek troops disembarked at Smyrna, Mustafa Kemal, as governor of Erzerûm, was disembarking at Samsun to start a military adventure and a national movement unexampled for sheer audacity. The British at that time covered Constantinople with their fleet, and controlled the sultanate, the khalifate, and the cabinet. The Greeks with a strong force held Smyrna and the surrounding country. The Italians held Adalia, the French Cilicia, and the British Transcaucasia. British agents in Asia Minor and foreign diplomats at Versailles were busy preparing and planning a division of Asia Minor into Kurdish, Turkish, and Armenian autonomies, Greek annexations, and imperialist spheres of influence. Undismayed, the Turks collected an army and convened a nationalist congress, first at Erzerûm then at Sivas, which repudiated the Constantinople government and proclaimed (28th January 1920) the 'National Pact,' claiming Constantinople, Smyrna, and even Adrianople as within the territory of the Turkish nation. Constantinople followed this strong lead by the re-opening of parliament and by replacing the Old Turkish cabinet by Young Turks. In the course of the winter of 1919–20 the authority of the sultan's

government at Constantinople was confined to the Allied lines, while the national government, under Mustafa Kemal at Angora, was accepted by all Anatolia and most of Thrace. In February 1920 the British announced that Constantinople might become the capital of the Turkish nation, if the Turks would renounce Smyrna and Adrianople. But the only effect of this was that Constantinople became more and more nationalist, until in March it was occupied by the Allies and the leading nationalists were deported to Malta. An Old Turk cabinet was put in office, and the sultan-caliph was made to outlaw the nationalists. In June appeared the Treaty of Sèvres, which assigned to Greece all Thrace up to the Constantinople lines and Smyrna with its hinterland, created Arab, Armenian, and Kurdish autonomous states, internationalised Constantinople and the Straits, and subjected the Turkish nation to the same military restrictions as other enemy countries. The Turks replied by taking the field both at Angora and Adrianople in alliance with the new Soviet state. The Armenian and Kurdish autonomies faded away, and the Italians found themselves hard pressed in Adalia, the French in Cilicia. Then the Greeks were launched against the Turks. One Greek army cleared the Smyrna region; another, landing at Mudania, took Brusa; and a third covered Adrianople and Thrace. In August the Constantinople cabinet accepted the Treaty of Sèvres. But this, the last of the peace treaties, was the first to be abrogated—in fact, it was never enforced. The renascence of the Turkish nation and its military resistance, hopeless as they seemed, had very swiftly exposed the weaknesses of their overwhelming opponents. The Greek armies in Asia Minor, though apparently the mandatories of the victorious Allies, had not the support either of the French or the Italian governments. The policy of the Treaty of Sévres, which converted the Ægean into a Greek lake, and clearly contemplated the restoration of a Greek empire at Constantinople, represented merely the alliance between Mr Lloyd George and M. Venizelos. First, the Italians, realising that their own imperial ambitions in Asia Minor were impracticable, began to support the Turkish nationalists. Then the French, recognising that their position as mandatories for Syria was imperilled by an Anglo-Greek and an Anglo-Arab association on either side of them, also entered into relations with Angora. The Soviet Federation, having cleared its territories in the Ukraine and Crimea of the last of the White invasions, began again to advance in the Caucasus, and the Armenian, Georgian, and Tatar states there passed from British to Russian protection.

The internationalist and imperialist front having been thus broken up, the struggle became a direct race war between Turks and Greeks. In the spring of 1921 the Greeks began pressing for a final military decision, which ended in their repulse on the Sakkaria and their retirement to positions covering Eski Shehir and Brusa. The French thereupon concluded a formal convention with Angora, while the British vainly tried to make peace between Greeks who believed that the restoration of the Greek empire was within their grasp, and Turks embittered by the devastation of their homelands. In 1922 the Greeks, realising that a conquest of Anatolia was impossible, concentrated on Thrace and on the conversion of the Allied occupation of Constantinople into a Greek occupation. But their attempt to enter Constantinople was frustrated by the Allied garrison; while the Turks, breaking through their demoralised and defeated fronts in Anatolia, drove them back upon Smyrna and the Straits. Smyrna was evacuated and burnt by the Turks, enraged at the part this Greek city had played in the wasting of Turkish territory. As the victorious Turkish armies advanced up to the British outposts covering Constantinople, pressed between them, and penetrated the city itself with their agents, war between the Turks and the British became imminent. But the British empire was in no mood for further warfare, and its rulers were not unanimous as to the pro-Greek policy that had been pursued. The Coalition government of Mr Lloyd George was overthrown in favour of a pro-Turk Conservative ministry. King Constantine of Greece was for the second time deposed, and the armies of Mustafa Kemal were appeased, in an armistice concluded at Mudania, 11th October 1922, by a promise of an early evacuation of Constantinople. On this basis the Turks, now masters of the situation, agreed to come into conference at Lausanne, where, after prolonged negotiations and one complete rupture for several months, a treaty was eventually signed which terminated an empire that, as Roman, Byzantine, Latin, Greek, and Ottoman, had subsisted for fifteen hundred years (24th July 1923). Under this treaty the Turkish nation recovered Constantinople, Adrianople, and Thrace, Smyrna, and Anatolia, Kurdistan and Greater Armenia, in unrestricted sovereignty with a southern frontier following the frontier assigned to Syria and 'Iraq in the Treaty of Sèvres as modified by the Franco-Turkish agreement of 19th October 1921. The eastern frontier was much that of the defunct empire with an accession of territory about Kars and Ardahan obtained by the Treaty of Kars (Oct. 1921) from the Soviet Federation. The international control of Constantinople and the Straits was renounced by the British in return for the right of sending a restricted tonnage of cruisers through to the Black Sea. Turkey recovered two islands covering the Dardanelles, the other Ægean islands remaining Greek with the exception of the islands of Rhodes and the Dodecanese retained by the Italians, and Cyprus, definitely annexed by Great Britain early in the war. Arrangements were made for apportioning the Ottoman debt, but foreign financial control in Turkish territory, though apparently sustained in principle, has been suspended in practice. But the most important innovation in the treaty was the sanction it gave to the Turkish policy of expelling all non-Turkish elements from the national territories. Under the provisions for 'exchange of populations' as elaborated in a subsequent special convention (23d January 1923), the indigenous Greek populations of Thrace and Asia Minor were expelled and exchanged against those Turkish populations in Macedonia and Thessaly that had come under Greek sovereignty. The Greek population of Constantinople was excluded from this, but was in part nevertheless expelled under various pretexts, while the Orthodox patriarchate of Constantinople was deprived of its political position, and with the other Christian churches was disestablished. Having thus secured relief from the Christian international institutions of the empire which had survived five hundred years of Ottoman rule, the Turkish nationalists turned their attention to its Islamic institutions, which they now realised were scarcely less incompatible with their ideal of converting Turkey into a national state on Western lines. The sultan, Mohammed VI., who had succeeded in 1918, having become a mere agent of the Allied occupation, had fled from Constantinople before it was surrendered to the Turks. His successor, Abdul-Mejîd, was not invested with the sultanate, but merely with the khalifate in virtue of election by the new national assembly at Angora (18th November 1922). On 2d October 1923 the Allies evacuated Constantinople, and on the 29th the Turkish state was declared a republic under the

presidency of Mustafa Kemal—a presidency little short of personal government. The curious experiment with the khalifate did not last long, and on 3d March 1924 the khalifate was abolished; while the Orthodox patriarch, persisting in asserting his ancient authority, was summarily deported. Constantinople ceased to be the capital of Eastern Christianity as it had ceased to be the citadel of Islam. It also ceased to be the commercial centre of the Near East; for it had owed this position not only to its geographical situation, but also to the international régime maintained there for a thousand years by Byzantine and Ottoman rulers. These extra-territorial privileges, originally granted by Greek emperors to Italian commercial colonies, and augmented by Ottoman emperors in favour of the colonies and commerce of Western peoples, had developed until Constantinople was in practice, if not in principle, internationalised. This whole international régime of commercial and judicial capitulations disappeared with the Treaty of Lausanne, as also did most of the Greek, Armenian, and foreign commercial communities. At the same time, the Turks, rightly recognising that their new national government would, if it were transferred to Constantinople, be exposed to corruption in that Byzantine and Levantine milieu and to coercion by British or Russian sea-power, decided that the capital of the new nation should remain at Angora. The result of this has been a complete suspension of vitality in Constantinople, and a loss of business good-will to the otherwise admirable moral and social revolution effected by Angora. This revolution has rebuilt from the foundations not only the political and judicial institutions of the country, but has remodelled its fundamental legal and social ideas and has carried its reconstruction into the most intimate domestic details and personal habits. Only a few examples can here be cited to illustrate this sudden conversion of a ruling class within the Islamic State into a republic based on European social contracts. The foundations of the Islamic State in the Koran and Sheriat have been swept away and Islam reduced to no more than a religious creed subordinated to a constitutional government. Even the Mejellé, the Ottoman civil code, which adapted the jurisprudence of the Islamic State to modern requirements, has been replaced by a new code adopted bodily from a Swiss model. A successful campaign against the characteristic costumes of the East has coerced the individual Turk into an outward conformity with this revolution; which has also been brought home to him by such innovations as the complete emancipation of and equal rights for women. In short, so far as Turkey is concerned, the changeless East has undergone a change even more sudden and sensational than that experienced by other Eastern communities that have come into contact with the eastward tide of European nationalism and socialism.

The intransigent nationalism of the Turks was not long in involving them in a collision with the only race that still shared with them their national territories—the Kurds. A nationalist movement among the Kurdish tribes in 1925 that took the form of a reaction in favour of Islamic institutions as against nationalist ideas was crushed so completely as to render a revival of trouble from this source unlikely in the near future. At the same time a peaceful settlement, largely effected through the mediation of the League of Nations, of the dispute with Great Britain over Mosul, gave some practical proof of the effective entry of Turkey into the community of civilisation.

Books of Reference.—The Ottoman Empire (General): Hammer-Purgstall, *Geschichte des O. R.* (18 vols.; French trans. 1893); Gibbons, *Foundation of O. E.* (1916); Miller, *O. E. and its Successors* (1923); Pears, *Turkey and its People* (1911); Eliot, *Turkey in Europe* (1907); Foreign Office Peace Handbooks, 16, 58 to 62—*Turkey in Europe; Turkey in Asia; Anatolia; Armenia;* and *Kurdistan*—1920; Lord Eversley, *The Turkish Empire* (1923); Lane Poole, *Turkey* (1922); Jorga, *Geschichte des O. R.* (5 vols. 1913).—Special (Law): Young, *Corps de Droit Ottoman* (7 vols. 1906); Nouradoungian, *Recueil d'actes internationaux* (4 vols. 1903); Tesla, *Recueil de Traités* (11 vols. 1911).—Eastern Question: Foreign Office Peace Handbook, 15 (1920); Marriott, *The Eastern Question* (1918); Driault, *La Question d'Orient* (1917); Ancel, *Manuel Inst. de la Q. d'Or.* (1923); Holland, *Eur. Conc. and the E. Q.* (1885).

The Turkish Republic: Mears, *Modern Turkey* (1925); Toynbee, *The Western Question in Turkey* (1922) and *Turkey* (Modern World, 1926); Price, *Rebirth of Turkey* (1923); Djemal Pasha, *Memoirs* (1922) Young, *Constantinople* (1926); British Institute of Int. Affairs—Annual Survey.

Literature.—Turkish poetry is closely modelled upon the Persian style with which the Ottomans became familiar during their association with the Seljûks (q.v.), who had become deeply imbued with Iranian ideas in their long residence among the Persians. Like the Seljûks, the Osmânlîs assimilated the literature of the people they subdued. Firdausî and Nizâmî had already written their masterpieces before the name of Ottoman was heard, and at the time of their settlement in Asia Minor Sa'dî and Jelâl-ed-dîn Rûmî were attracting the admiration of the eastern world. The latter was a resident at Iconium (Kôniya), the Seljûk capital, and his mystical verses or *mesnevis* impressed their character upon the whole literature of the new power then rising in Anatolia. Ottoman poetry is full of the subtle esoteric ideas which are characteristic of its Persian exemplars. Its long metrical romances, while apparently treating of the loves of Leylî and Mejnûn, of Khusrev and Shîrîn, or of Joseph and Zuleykha, are really occupied with the deeper thoughts of the longing of the soul for God, the yearning of the heart for heavenly wisdom, the struggle between human passion and the endeavour towards divine serenity. The short odes or *ghazels*, the most characteristic of Ottoman poetic forms, 'though outwardly mere voluptuous songs, are in reality the outpourings of hearts drunken with the love of God.' Nor is the mystic spirit the sole gift of Persia to the Turkish poet. He has also borrowed the history and mythology of his predecessors, and, instead of the deeds of the old Turkish chiefs and the cult of the gods of the Caspian nomads, he celebrates the prowess of Persian heroes, of Rustem and Jemshîd, Kay-Khusrev and Ferîdûn, and the loves and tragedies of Leylî and Shîrîn and other Persian heroines. And the Ottoman poet followed the forms as well as the ideas of his Iranian masters, such as the *kasîda* or Arabian lyric, adopted by the Persians, in which the second hemistychs rhyme throughout the whole length of the composition; the Persian *mesnevi*, or rhymed couplet; and the *ghazel* or sonnet of the East. In all these the Persian love of playing upon words, far-fetched conceits, and extreme elaboration of metaphor is not merely emulated but exaggerated to intolerable excess: the grace of expression and finish of the form alone redeem the artificiality of the style and thought. Turkish poetry, it must be admitted, is lamentably unreal: it lacks warmth, and earnestness, and sincerity. It is throughout essentially a court poetry, mannered and insincere. There is nothing robust or healthy about it. There is nothing strong or masculine in its love or its patriotism. Throughout we trace the effects of an artificial town life, where genius is cramped in convention, and poetic art is no longer an inspiration, but a cast from the face of the dead.

Ottoman poetry begins soon after the establishment of the Ottoman empire. Already in the beginning of the 15th century Ahmed Dâ'î's 'gay and flowing songs of love and wine' delighted the court of Prince Suleymân at Adrianople, and poems had been indited by Ghâzî Fâzil, who had crossed the Hellespont on a raft with that prince on the night when the Osmânlis gained their first foothold in Europe. To write poetry soon became part of the accomplishments of kings and courtiers. Of the thirty-four sultans of Turkey twenty-one were poets of a sort, and Amurath the Great (Murâd II.), Mohammed the Conqueror, and Selîm I. (the Grim) were accounted bards of repute. The unhappy Prince Jem was especially noted for his poetic talent; and from Murâd II. to Murâd IV. (1421–1623) twelve successive sultans left poems which have come down to us. Generals and ministers followed the imperial example. The grand vezîr Mahmûd Pasha (d. 1474), the conqueror of Negroponte, delighted in the composition of *ghazels*, and Kemâl Pasha Zâda (d. 1534), as he rode to the conquest of Egypt with the Sultan Selîm the Grim, beguiled the way with recitations of the leading events of Egyptian history in choice Turkish verse. He was the author of the *Nigâristân*, a poem modelled on the *Gûlistân* or 'Rose-Garden' of Sa'dî.

The greater poets of Turkey, however, were not high dignitaries, but sons of mechanics, cutlers, saddlers, shoemakers; few were of rank or wealth. Their numbers and their merits rise and fall as the tide of Turkish conquest flows and ebbs. It is ever in a period of strong national feeling that the poetry of a people is called forth; and it was in the golden prime of Sultan Suleymân, when the confines of the kingdom were at their broadest, when the name and fame of the Ottoman empire stood higher than ever before or since, that the opportunity of Turkish poetry arrived, and with it came the masters of the art. To the age of Suleymân and his predecessor Selîm belong Mesîhî (d. 1512), Lâmi'î (d. 1531), Ghazâlî (d. 1534), Fuzûlî (d. 1562), Fazlî (d. 1563), and Bâkî (d. 1600). The best Turkish poetry is chiefly included in this epoch, which partly corresponds in time with our Elizabethan era. Lâmi'î's works, to which Von Hammer devoted 174 pages of his great History, include poems on old Persian romances, besides a multitude of *ghazels* and other short pieces. Fuzûlî, on the whole the greatest of Turkish poets, in spite of his provincial idiom, is best known by his *Leylî and Mejnûn* and his charming odes. Bâkî, the most famous of Turkish lyricists, was the friend of four successive sultans, filled some high offices of state, and received the unhesitating homage of all the poets of his day and the admiration of all succeeding generations. His famous elegy on Suleymân the Great is unsurpassed in Ottoman literature. The appreciation of nature which is shown in such poems as Mesîhî's 'Ode to Spring' and Bâkî's and Lâmi'î's odes to 'Autumn,' and which is characteristic of their period, forms one of the best features of Turkish poetry. Their love-songs, on the other hand, are disappointingly stilted and artificial; and it is singular that, in spite of their military renown, the Turks have no martial poetry of the old time: there is hardly a respectable war-song in the whole range of mediæval Ottoman literature.

The classical period of Ottoman poetry, which began with the 16th century, did not end with the glorious reign of Suleymân the Great (d. 1566). Nef'î of Erzerûm (d. 1635), the most renowned of Turkish satirists, wrote in the time of Murâd IV.; Nabî (d. 1712) wrote thousands of couplets of a didactic tendency; and Nedîm (d. *c.* 1727), perhaps the most finished and certainly the most blithe of Turkish singers, belongs to the time of Ahmed III. He was the last of the old classical school of Ottoman poets, though Sheykh Ghâlib (d. 1795), the author of 'Beauty and Love' (*Husn-u-Ashk*), was little inferior to any of the older writers.

Turkish prose-writers have been and are very numerous, though here again originality is lacking, and their activity has been chiefly displayed in translations from the Persian and Arabic. One of their earliest works is the well-known *History of the Forty Vezîrs*, a collection of old folk-stories, written in the first half of the 15th century, and now translated by E. J. W. Gibb. The collections of stories centring round the Khodja Nasreddin have also become well known in Europe in various translations as especially characteristic of Turkish humour. Sinân Pasha, the vizier of Mohammed the Conqueror, was the first prose stylist of merit. Sa'd-ed-dîn, the historian, in spite of his elaborate style and alliteration, was a writer of conspicuous ability, and Na'îma, his successor, is as vigorous and direct as Sa'd-ed-dîn is circumlocutory and ornate. The *Tâj-et-Tevârîkh* of the former goes down to 1520, and Na'îma's history covers the ground from 1591 to 1659. Evliya the traveller, and Hâjjî Khalîfa, an encyclopædic writer on history and bibliography, are among the best-known Turkish authors.

The Europeanisation of the Ottoman empire early in the 19th century was accompanied by a transfer of its literary allegiance from Persia to Paris. In its first phase this literary renascence was exotic, the best exponents of this phase being Shinasi Effendi, poet and prose-writer. Later this movement towards European models became associated in the middle of the last century with the revival of Turkish race feeling, the precursor of the national renascence in this century. Among writers of this school were Zia Bey, essayist and poet; Jevdet Pasha, a historian; Ekrem Bey, a poet; Hamid Bey, a dramatist; Wasif, a poet, who wrote in Stambouli dialect; and last, but not least, Kemal Bey, who covered the whole field of literary expression, and was the originator of the Young Turk movement. A body of novelists and of literary critics also developed, among the former Sezayi Bey, Hussein Rahmi, Ahmed Rasim, and Aliyé Hanum; among the latter Muallim Naji and Ebuzzia Tewfik. The purification of the language from Persian forms and Arabic words was furthered by the Turkish dictionary of Ahmed Vefik, and later by the association known as Yeni-Kalemler ('new pens'). The national renascence and the feverish years of warfare that followed the Great War have naturally produced a promising output of prose and poetry. But as to which of the younger writers can be placed among the first poets and prose-writers of the Turkish race it is still too soon to judge. The one exception perhaps is Halidé Hanum, the heroine of the nationalist warfare, whose novels will always be associated with that heroic struggle.

The best English works are Sir James W. Redhouse's *History, System, and Varieties of Turkish Poetry* (1878) and E. J. W. Gibb's *Ottoman Poetry* (5 vols. 1900–8). See also Von Hammer-Purgstall's *Geschichte der Osmanischen Dichtkunst* (Pesth, 1836); G. Jacob's *Türkische Litteraturgeschichte* (1900–8) and *Türkische Volkslitteratur* (1901). For English students, Redhouse and Wells have compiled the best Turkish dictionaries and grammars. Sami's *Dictionnaire Turc-Français et Français-Turc* (1883) is summary but convenient.

Turkey (*Meleagris*), a genus of gallinaceous birds in the sub-family Meleagrinæ of the pheasant family, Phasianidæ. There has been strange confusion in regard to its names, for 'turkey' and Meleagris both belonged originally to the guinea-fowl. The name 'turkey' has nothing to do with the country of that name; it probably refers to the

utterance of the call 'turk, turk.' The domesticated turkey is derived from the American *Meleagris gallopavo*, and was established in Europe by 1530. The American wild species is represented by three geographical races, once extending from southern Canada to Mexico, distinguished by having the main tail feathers and their upper coverts tipped with white, buff, and chestnut respectively. It is maintained by some authorities that the taller, blacker, hardier Norfolk breed of British poultry-yards is derived from the northern American race (*M. americana*), and the more variegated Cambridgeshire breed from the southern American race (*M. mexicana*). But the northern, the Mexican, and a third race are to be included in one wild species *M. gallopavo*, which is to be distinguished from the very different *M. ocellata* of Yucatán, British Honduras, and Guatemala, a gorgeous bird approaching a peacock in its splendour.

The reddish head and neck of the common turkey are almost bare of feathers, but covered with a warty wrinkled skin. On the head of both sexes there are livid wattles, and above the bill a conical fleshy caruncle, pendent ordinarily, erected during excitement; and the larger male is marked by a bunch of long black feather-bristles hanging down on the chest, and by a stout spur on the instep. The strong curved bill is red, and so are the legs; the tail is broad and rounded, and is raised and expanded by the strutting turkey-cock. He also trails his wings on the ground as he utters his loud 'gobble.' Most of the feathers are coppery-bronze, with a sheen of gold and purplish-green, and with black markings; the pinions are brown barred with white; the tail is black and brown with a dark broad band near the posterior margin. The other species, *M. ocellata*, which has not been domesticated, has a blue caruncle with a red tip, and, at the ends of the tail feathers, brilliant eye-like markings of green-blue margined with copper.

The wild turkey used to be incredibly common over nearly one-half of the United States, but it has paid for its palatability, and is now sadly restricted. Dr Hornaday doubts if even one flock exists in the north anywhere west of Pennsylvania. It is still to be found in some of the open forests of Virginia and Florida, and there are flocks in Texas and Oklahoma. Of recent years there has been are invigoration of the wild stock in some of its old haunts, a welcome turn of the tide. Mr Archibald Rutledge reports (1926) the presence of wild flocks of two dozen or more in some parts of Pennsylvania.

A large wild turkey-cock may have a length of forty-six inches and a weight of twenty-eight pounds. The flight is strong and silent, but not long-sustained; there is impressive vol-planing down the slopes of the hills; there is quick running in the open glades of the woods. Vision and hearing are extraordinarily acute, but when the birds are off their guard they move about somewhat noisily. They roost in high trees, but spend the daylight hours on the ground, searching for seeds, fruits, and other parts of plants, with an occasional insect or lizard as relish. They do not show much intelligence, and when they are shifting on foot from one region to another they make a good deal of fuss if they come to a broad river. After noisy consultation, which may last for days, the leader gives the signal, and they all mount to tree-tops, whence they take wing. They are not very confident, however, in their flight, and some tumble into the water, completing the rest of the journey by swimming.

During a large part of the year the cocks and hens live apart, but they come together in flocks in the autumn and winter months, and seek the more sheltered valleys over their now much-restricted range. The cocks fight in the spring, each seeking to secure at least one hen. The strutting before their desired mates is familiar in the domesticated forms. After the pairing there is a separation of the sexes; the nine to fifteen large eggs are laid in a ground-nest of withered leaves and the like. The hens are very careful mothers, and the nest is well hidden, the leaves being drawn over the eggs when the brooding bird leaves them to snatch a hurried meal. After the young are hatched the mother leads them about for months in little flocks, defending them courageously against enemies. She keeps out of the way of the cocks, who do not seem to be well-disposed towards their offspring. Domestication has not produced great changes in the turkey, which retains a sturdy independence, except in so far as advantage has been taken of the hen's strong brooding instinct to make her sit month after month on successive clutches of the eggs of fowls or to act as foster-mother to successive sets of chickens. This is apt to be very exhausting. The breeder of turkeys has to guard against diminution in size, vigour, and decorativeness, against an intestinal and liver Protozoan disease called 'blackhead,' and against the 'gapes' disease of young birds caused by a threadworm (*Syngamus trachealis*) in the windpipe. An interesting survival of the wild state is sometimes seen when domesticated turkeys go to roost in a lofty tree. The young birds are fond of chopped nettles and dandelions, backed up with grain, meal, hard-boiled eggs, and the like. The brush-turkey or Tallegalla (q.v.), *Catheturus lathami*, is one of the Mound-birds, not nearly related; the name is badly applied to the African Bald Ibis (*Geronticus calvus*) and to the Australian Bustard (*Eupodotes australis*). See article Turkey in Newton's *Dictionary of Birds* (1896).

Turkey Buzzard. See VULTURE.

Turkmanshai, a village of the Persian province of Azerbaijan, 65 miles ESE. of Tabriz, is the place where, on 22d February 1828, was concluded the treaty between Persia and Russia, by which the former resigned to the latter the Armenian provinces of Erivan and Nakhitchevan.

Turkmenistan. See TURKESTAN.

Turks, an important and wide-spread family of the human race, found under various tribal and sub-tribal names from the banks of the Lena through central Asia and Asia Minor to the European shores of the Bosporus and the Ægean. Formerly classed amongst the 'Turanian' or 'Beyond-Oxus' peoples as distinguished from the 'Iranian' or 'Cis-Oxus' peoples, it is now, however, more usual to say that they are of the Mongolo-Tatar ethnological group, and speak languages of the Ural-Altaic family. To them belong at the present day Yakuts, Siberian Tatars, Kirghiz, Uzbegs, Turkomans, Karakalpaks, Kazan Tatars, and Dungans, as well as the Ottoman Turks; linguistically the Bashkirs and Tchuwashes, both of east Russia, fall under the same head. The Dungans are Mussulmans, wearing Chinese clothes and speaking Chinese; the Chinese call them 'turbaned Mussulmans,' and the mysterious word Dungan is supposed to be connected with a Turkish word *turigan*, meaning 'left behind.' Old Turkish stocks no longer extant under the names given them by Rubruquis, Marco Polo, &c., were the Pechenegs in Russia, the Cumanians, the Chazars, the White Huns, and the Seljuks (from whose wrecked empire the Ottoman Turks are sprung, through a Seljuk captain named Othman or Osman). The existing Turkish peoples are all Moslems, save the Yakuts, and mostly nomadic. They have often sent forth conquering hordes of warriors, and have given ruling families or races to China,

Persia, India, Syria, Egypt, and the empire of the Khalifs.

See especially TURKESTAN, TURKEY; also ASIA (p. 499), BABER, SELJUKS, TAMERLANE, TATARS; Vambéry, *Skizzen aus Mittelasien* (1868), and *Das Türkenvolk* (1885).

Turkomans. See TURKESTAN.

Turks Islands, a small group ESE. of the Caicos.

Turku, Finnish name of Åbo (q.v.).

Turmeric, the rhizome or rootstock, usually having pointed cylindrical branches, of *Curcuma longa* (family Zingiberaceæ). This species of Curcuma is a handsome herbaceous plant, the flowering stem of which has long, narrow, sheathing leaves, and above these a leafy spike of yellow flowers. It is cultivated all over India, but it is also grown in the East Indian Islands, China, and the Fijis. The tubers, which are yellowish externally, yield a deep yellow powder of a resinous character. Turmeric has been long employed in the East as a medicine, and as a yellow dye which can be changed into a deep, brownish red by alkalies, but neither colour is permanent. It is a principal ingredient in some Indian articles of food, including curry-powder. In western countries it is not now much used in dyeing, nor in medicine, but it is very useful as a chemical test for the presence of alkalies, any alkaline substance quickly changing its colour from yellow to reddish brown. Mustard is frequently adulterated with turmeric, and so also are some other substances. Turmeric has an aromatic taste and a peculiar odour not unlike that of ginger. The odour is due to an essential oil called *turmerol*, of which the tubers contain about 1 per cent.; and the colouring principle is known as *curcumin*. African turmeric, brought from Sierra Leone, is obtained from a species of Canna.

Turmeric (*Curcuma longa*): *a*, root; *b*, spike of flower; *c*, leaf before expansion (Bentley and Trimen).

Turnau (Czech *Turnov*), a town of Bohemia, on the Iser, 64 miles by rail NE. of Prague. Its specialty is jewellery. Here on 26th June 1866 the Prussians defeated the Austrians. Pop. 7000.

Turnberry, a shattered castle on the Ayrshire coast, 6 miles N. of Girvan. It has claimed to be Robert Bruce's birthplace. A lighthouse (1874) stands within the ruined walls.

Turnebus, the Latinised family name of Adrien Turnèbe, a great scholar of the 16th century, born at Rouen in 1512. According to some accounts he was of Scottish descent, his family name having been originally Turnbull. Educated at the university of Paris, he greatly distinguished himself in the study of the ancient classics, and eventually, as professor of Greek and Philosophy in the Collège Royal in Paris, attained a European reputation. Montaigne, who knew him personally, declares that he was the greatest man of letters who had appeared for a thousand years. When Turnèbe died (12th June 1565) it was the universal opinion that learning and virtue could not have sustained a greater loss. See Maittaire, *Historia Typographorum aliquot Parisiensium* (8vo, Lond. 1717). An account of Turnèbe is also prefixed to his miscellaneous works published at Strasburg in 1600.

Turner, CHARLES TENNYSON, born July 4, 1808, at Somersby, third son to the vicar (see TENNYSON, ALFRED), educated at Louth School and Trinity College, Cambridge; graduated 1832, ordained 1835; for many years the devoted vicar of Grasby, a village in the Lincoln wolds. In 1837 he married Louisa Sellwood, sister to Emily, Lady Tennyson; took the name of Turner under the will of a relation; died April 25, 1879; commemorated by his deeply loved and loving brother Alfred in the lines *Midnight*, June 30, 1879.

From 1830 to 1873 C. T. Turner published several small series of verse (collected in one volume, with a memoir, 1880). The first, issued during his college days, won much praise from S. T. Coleridge. Throughout life the poet adhered to the sonnet form, but with an irregular distribution of the rhymes. His was a nature singularly and nobly simple, pure, and tender with a woman's tenderness: 'at once,' his nephew Hallam (preface to the volume of 1880) justly observes, 'childlike and heroic.' Add that he was a well-read scholar, gifted also with very fine and sympathetic observation of nature and of village-life. Hence these idyllic sonnets—sincere, pathetic, subtle, sometimes verging on quaintness—cover, in their pensive range, a vast number of motives from English country ways. By him and by his admirable contemporary poet, W. Barnes of Dorset, a hundred wild flowers, we might say, effaced or disappearing under the remorseless ploughshare of modern progress, have been preserved for us. Such work in an age like ours should have a wide appeal to Englishmen. But fit audience and few will almost uniformly be the fate of the writer who confines himself to the form of sonnet-sequence. His *Collected Sonnets* were published in 1898.

Turner, JOSEPH MALLORD WILLIAM (who usually signed J. M. W. Turner), the most celebrated of English landscape-painters, is believed to have been born in Maiden Lane, Covent Garden, on the 23d of April 1775, but he himself said that he was born at Barnstaple in Devonshire (his paternal grandfather lived and died in Devon). He was the son of William Turner, a barber, who taught him to read and sent him to school at Brentford and afterwards to Margate, but he had little regular education and remained almost illiterate through life. He may possibly have heard something about Rome and Carthage at Brentford, cities that always had a great interest for him. Very early in life he got some initiation into architecture and worked with the architect Hardwick, who perceived his natural gift for painting and recommended him to become a pupil of the Royal Academy. Turner's childhood was remarkable for the absence of any civilising feminine influence. His mother is said to have had an ungovernable temper, and to have been almost if not quite insane. In other respects the early life of Turner was more fortunate. He soon found friends and instructors. He knew Sir Joshua Reynolds and studied in his house. He got an early initiation into water-colour through his acquaintance with Dr Monro and Girtin, and, being in a city where art was to be seen, he became acquainted with most of the elder masters of landscape, at least in their works, and with those of the then modern water-colour painters. Turner

began exhibiting at fifteen when still an incipient student, but such was his precocity, and perhaps also the relatively low state of art at that time, that he went on exhibiting and learning during the same years. At eighteen he began to travel, being sent by a publisher into four English counties, and at twenty he had visited Wales. A year later he made architectural drawings in some of the principal English cathedral cities. Like Titian he was wide-awake and hard at work already in his profession early in the morning of life. On attaining his majority he was already an established artist, and as early as 1799 he began as a marine painter. In the same year, at the age of twenty-four, he was elected an Associate of the Royal Academy. At twenty-eight he was elected Academician, and at thirty-three professor of Perspective. During these years he does not appear to have earned a large income, but being a strict economist soon knew how to place himself above pecuniary difficulties.

The biography of Turner is of little interest except as a study of character. He never married, he took no share in public life, kept aloof from society, and knew no changes, except a few changes of residence in England and his home or foreign tours. Though economical to miserliness, after 1808 he had always two residences and sometimes even three. This indulgence may be attributed to a love of personal secrecy and obscurity. His town-house in Queen Anne Street was a sufficiently commodious residence with a studio and a gallery; his country-houses were first at Hammersmith and afterwards at Twickenham. By hard work and economy Turner soon attained pecuniary independence, and worked in complete freedom from any money-pressure, yet with remarkable rapidity. His travels were of the nature of furtive disappearances; he wandered much about England, France, Switzerland, and Italy, but the story of these excursions is told by his works alone, except that some chance traveller met him now and then, always with his pencil in his hand and travelling very economically, for the most part on foot. That his travels were a part of his life is indicated by the title of one of his publications, *Turner's Annual Tour*. He rose very early in the morning, worked many hours each day and always in complete secrecy, and it is not believed that in his own house he ate any regular meals. His houses were very badly kept, even his gallery of pictures being dirty and disorderly. So he went on in solitary toil till old age, and died in his seventy-seventh year (19th December 1851) in a temporary lodging at Chelsea under the assumed name of Booth.

Everything in Turner is indicative of the man of genius. His artistic gift was a special faculty, cultivated to the utmost by a long life of the hardest labour and to the neglect of everything else. The artistic gift that absorbed all his energies was itself of a most peculiar character. He perceived more in nature than any landscape-painter who had preceded him, yet at the same time his imagination was so overpowering that it modified all his materials. His power of drawing was remarkable both for strength and for an extreme refinement, but accuracy was made impossible for him by his constant desire for beauty or sublimity of line and for agreeable composition. He habitually increased the relative height of objects such as towers, hills, river-banks, &c., and he compressed every subject by bringing materials together from all quarters. He almost invariably altered the character of what he saw in order to attain some expression that he desired. His dominant impulses were to make things more beautiful, mysterious, and sublime than they are in nature. His system of light and shade was founded at first on the old masters with their heavy darks; but afterwards in his more independent maturity he worked out another scheme, that of pale general tones with a few strong darks for opposition. Turner was in various ways clever in black and white. Almost all his work done directly from nature consisted of memoranda in chalk or pencil, on gray or white paper, without colour, the colour being often added afterwards from memory. He was also an excellent etcher in pure line, but did not attempt to combine line and shade (except slight indications of shade) in etching, trusting for that to the finishing of his plates in mezzotint. His etched work is the *Liber Studiorum*, begun in 1807 and cut short in 1819. It was to have consisted of 100 plates, of which seventy-one were completed. As a water-colour painter Turner was unrivalled in delicacy and in brilliance of execution, but he never became *technically* one of the supreme painters in oil, nor did he make progress in his later work, which resembled water-colour in principles of treatment. Turner's position in art is that of one of the three most famous landscape-painters (Claude, Turner, Corot). In knowledge of nature he was far superior to the other two, in the sense of elegance at least their equal, and there was a tragic side to his genius that is wanting in the others. Turner has had singularly little practical influence on landscape art, which has gone more in the direction of Constable.

Although by nature very reserved and disposed to keep aloof from mankind, Turner was sometimes friendly and nobly generous. The object of his saving was to found an asylum for distressed artists, an intention plainly expressed in his will, but thwarted by the lawyers because the testator was ignorant of legal forms. Turner kept many pictures that had proved unsaleable at first, though tempting offers were made for them later, and he bequeathed them to the National Gallery on condition that they were to be kept together in rooms bearing his name. Whilst the estimate of his work has risen, it is now understood that his intellect was that of a prodigy with abnormal activity in one direction and feebleness or incapacity in almost all others. His personal appearance too was against him, as he was plain and short and had not the style or bearing of a gentleman.

The following are a few of the most important chronological memoranda of Turner's professional career. 1796, he exhibited eleven pictures at the Royal Academy. 1798, he began to paint mountain scenery, and an effect in the view of Norham Castle, which did much to found his reputation. 1799, date of a naval picture, the Battle of the Nile. 1802, ceased to pay deference to topographic truth, and painted his famous but anti-topographical picture of Kilchurn Castle. 1803, beginning of continental subjects: 'The Vintage at Mâcon,' 'Calais Pier,' also first studies of the Alps. 1806, imaginative picture of the 'Garden of the Hesperides, with the Goddess of Discord choosing the Apple.' 1807, Turner invited a comparison between himself and Claude, by painting his 'Sun rising in Mist' in rivalry with the French master. 1811, 'Apollo and the Python.' 1813, 'The Frosty Morning.' 1815, 'Crossing the Brook,' an idealisation of Devonshire scenery; also the imaginary 'Dido building Carthage.' 1823, an idealisation of Italy in the 'Bay of Baiæ,' and idealised views of Yorkshire in Whitaker's *History of Richmondshire*, marking a great progress in illustration. 1824, *The Rivers of England*. 1825, *The Provincial Antiquities of Scotland*. 1827–38, the *England and Wales* series. 1829, the great imaginative picture, 'Ulysses deriding Poly-

phemus.' 1832, an idealisation of Italy in 'Childe Harold's Pilgrimage.' 1830–34, vignette illustrations of Rogers's Poems. 1834, illustrations to Scott. 1833–35, *The Rivers of France.* 1834, 'The Golden Bough,' a poetical picture. 1838, 'Phryne going to the Bath as Venus.' (In these years Turner's idealising faculty attained its utmost development.) 1839, 'The Teméraire.' (In 1840 he entered on his decline.) 1843, 'Opening of the Walhalla,' 'The Approach to Venice,' and 'The Sun of Venice'—the two latter remarkably beautiful though unreal. 1844, 'Rain, Steam, and Speed,' a purely impressionist picture attempting the severance of motion from substance.

Modern Painters, by John Ruskin, (5 vols., 1843–60), a brilliant and famous book, did much to increase Turner's reputation amongst the reading classes, but did not create his position, as he had already been for forty-one years an Academician, and had attained wealth and success when the first volume appeared. Ruskin estimated Turner's rank as that of 'the greatest painter of all time,' which is very disputable on technical grounds, especially with reference to his work in oil. A *Life of Turner* by Walter Thornbury (1862) was rather a collection of materials. The *Life* (1878) by P. G. Hamerton, the writer of the above article, was little more than an attempt to put already existing materials into a readable form; and in 1889 he published a new and shorter *Life of Turner* in French. The *Life* by Cosmo Monkhouse (1879), contained some valuable biographical criticisms. A large and handsomely illustrated Monograph by Sir Walter Armstrong appeared in 1903; and see books by C. A. Swinburne (1902), Chignell (1902), W. L. Wyllie, R.A. (1906), and C. Lewis Hind (1911), and Finberg's 'Complete Inventory of the Drawings of the Turner Bequest' (1910). Some thirty pictures exhibited for the first time in 1906 (till then kept hidden away in the stores of the National Gallery) were fine as to colour, and were made over to the Tate Gallery.

Turner, SHARON, was born in London, 24th September 1768, was articled to an attorney at the age of fifteen, and succeeded his master in the business before the period of his clerkship had expired. The intervals of a busy life he gave to hard reading and patient collection of materials, and published a meritorious *History of the Anglo-Saxons* (1799–1805). Other works were the laborious but badly written *History of England from the Norman Conquest to the Death of Elizabeth* (1814–15–23), *Sacred History of the World* (1832), a volume of essays and poems, &c. Turner died in London, 13th February 1847. For the last years of his life he enjoyed a pension of £300.

Turner, WALTER JAMES REDFERN, writer, was born in China in 1889, and was educated partly at Melbourne, and partly in Munich and Vienna. His publications include *The Dark Fire* (1918), *The Landscape of Cytherea* (1923), and other volumes of lyrical poetry; the narrative poem, *Paris and Helen* (1921); the tragi-comedy, *The Man who ate the Popomack* (1922); dramatic poems; *Orpheus or the Music of the Future* (1926), *Beethoven* (1927), and other striking volumes of music criticism; a dialogue, *The Aesthetes* (1927). His poetry is sensitive and full of imagery.

Turnhout, a town of Belgium, in the Campine district, 26 miles ENE. of Antwerp. It has a palais de justice (1371) and manufactures of cotton, linen, lace, paper, &c. Pop. 25,000. Here on 22d January 1597 the Netherlanders, under Prince Maurice, won a victory over the Spaniards; and on 27th October 1789 the patriots over the Austrians.

Turning, the art of shaping wood, metal, ivory, or other hard substances into forms having a curved (generally circular or oval) transverse section, and also of engraving figures composed of curved lines upon a smooth surface, by means of a machine called a *turning-lathe.* The immense variety of work performed by turning-machines necessitates great variations in their construction; but their mode of operation is always the same, and consists in fixing the work in position by two pivots or otherwise, causing it to revolve freely round an axis of revolution of which the two pivots are the poles, and holding a chisel or other cutting-tool so as to meet it during its revolution, taking care that the cutting-tool be held firmly and steadily, and moved about to different parts of the work till the required shape be obtained. Lathes are divided, with respect of the mode of setting them in motion, into *pole*-lathes, *foot*-lathes, *hand-wheel* lathes, and *power*-lathes; with respect to the species of work they have to perform, into *centre*-lathes, which form the outside surface, and *spindle*, *mandrel*, or *chuck* lathes, which perform hollow or inside work, though this distinction is for the most part useless, as all lathes of good construction are now fitted for both kinds of work. *Bed*-lathes are those used by turners in wood, and *bar*-lathes for the best sort of metal-work; and the small metal centre-lathe used by watchmakers is known as a *turn-bench.*

Turnip (*Brassica rapa;* see BRASSICA), a biennial plant, with lyrate hispid leaves; the upper part of the root becoming, especially in cultivation, swollen and fleshy. It is a native of Europe and the temperate parts of Asia, growing in borders of fields and waste places. It is commonly regarded as a native of Britain, although in most cases where it is found apparently wild it may be doubted if it has not derived its origin from cultivated varieties. It has been long cultivated, and is to be found in every garden of the temperate and cold parts of the world as a culinary esculent; it is also extensively grown in fields for feeding cattle and sheep. It was cultivated in India long before it could have been introduced by Europeans, and is common there in gardens and about villages. The cultivated varieties are very numerous. In them the upper part of the root assumes a globose, oblong, or roundish depressed form. Some are common to the garden and the farm, and some of the largest kinds attain such a size as to weigh 20 or 25 lb. Although the turnip is of great value for feeding stock, it is not very nutritious, no less than 88 to 95 parts of its weight actually consisting of water. Garden turnips are sown from the end of March to the end of August; field turnips generally in June, it being requisite that they should not be sown so soon as to incur a risk of their throwing up flower-stems in the first year, which, when it takes place, prevents in a great measure the swelling of the root and renders it coarse and fibrous. In dry weather the plants are apt to throw up flower-stems, and so disappoint the hope of the gardener. Moist cloudy weather is most favourable. Garden turnips are sown and allowed to grow much closer than field turnips, being gradually thinned out, and the thinnings used even when of small size. The garden turnips are generally of comparatively small size, more rapid in growth, and more delicate. The Swedish Turnip, or Swede, which was introduced into cultivation in Britain, from the north of Europe, more recently than the common turnip, and has proved of very great value to the farmer, is regarded by some botanists as a variety of the same species, and by some as a variety of *B. napus*, but more generally as a variety of *B. campestris*, a species common in cornfields and sides of ditches in Britain and the north of Europe. It is more nutritious than the turnip, containing about 11 per cent. of dry matter.

The cultivated turnip grows best in a rich free soil. The mode of culture varies with the soil. Where the soil is light and dry a smaller amount of ploughing, harrowing, and drilling is necessary

than on stiff soils. The turnip is not well suited to clay soils, although it is often grown on them. A complete pulverisation of the soil is requisite before the sowing of the seed. On light soils a crop of turnips generally succeeds wheat or oats. Turnip-land is generally made up in raised drills by the plough, and the seed is sown by the drilling-machine on the top of the narrow ridges, which are about 27 inches wide. Moderate dressings of artificial manure, such as superphosphate of lime, crushed or dissolved bones, kainit and nitrate of soda, or other such manures, produce great crops of turnips. The more general practice, however, is to give a mixed dressing of farmyard dung and artificial manure. The young plants are thinned out by the hand-hoe to from 9 to 11 inches apart, and the ground is stirred and carefully kept clean by the plough or horse hoe. The turnip-crop is thus of great use in clearing the land of weeds. In many places part of the crop is eaten on the ground by sheep, which are confined to a small part of the field by means of movable fences. It is common to leave one of each three rows of turnips for this purpose, the other two rows being carried to the farmyard for feeding cattle or stored. Turnips are stored either in a house or in conical heaps, covered with straw and earth. They are sometimes protected from frost by being earthed up in rows by the plough. Some kinds are much more easily injured by frost than others; the Swedish turnips least of all.

The introduction of the turnip as a field-crop is one of the most important events in the history of British agriculture. It has rendered possible a rotation of crops which has been extremely advantageous, and has made the supply of butcher-meat more constant, by providing a supply of winter-food for cattle and sheep, whereas formerly all depended on the pasture. As a field-crop turnips were not raised in Britain till the end of the 17th century. Turnip-husbandry was introduced into Roxburghshire from Leicestershire about the year 1764, but was soon carried to a perfection in Scotland far beyond what it had previously reached. The climate of Scotland is well adapted for it, as is also that of Ireland; whilst the climate of North America is so unfavourable to it that it has not become an important crop there. Turnip-crops in Britain suffer very much from the two distinct diseases called anbury, or club-root, and finger-and-toe (see ANBURY). Superior culture is the best means of preventing these diseases. Plants weakened by drought are liable also to suffer from a white mould, a species of Erysiphe, which attacks the leaves and greatly injures the plant.

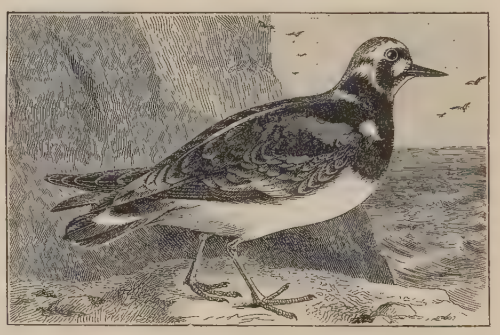
The turnip crop has to encounter many insect enemies. The most destructive in recent years has been the turnip-fly (*Phyllotreta nemorum*, Chevrolat), which devours the young plants before they are strong enough to be thinned. The leaves of the young turnip-plants are also attacked and often much injured by the green-fly or turnip-aphis (*Aphis rapæ*, Curtis); by the caterpillar of the diamond-back turnip-moth (*Plutella maculipennis*); by the caterpillar of the common dart-moth (*Agrotis segetum*, Westwood); by the grubs of the turnip sawfly (*Athalia spinarum*, Fabricius); and by at least two varieties of weevil, *Ceutorrhynchus sulcicollis*, the gall weevil, and *C. assimilis*, the seed weevil. The diamond-back moth fortunately seems to pay its visits of destruction at long intervals. It played great havoc with the crop in England and Scotland in 1891, destroying it beyond recovery in many parts. In Ireland the attack was lighter. Another serious attack occurred in Scotland in 1914. Earlier serious attacks occurred in 1851, 1837, and 1826. For all insect attacks the best preventive measure is a dressing of stimulating manure to force on the growth of the plants. Spraying the crop with a mixture hurtful to the insects, by means of the Strawsoniser, an air-power distributor, is also recommended.

Turnpike Roads. See ROADS, TOLL.

Turnsole (Old Fr. *Tournesol*, 'turning to the sun'), a name sometimes given to the Heliotrope and other plants, especially to the euphorbiaceous *Chrozophora tinctoria*, from which a deep purple dye is obtained. Turnsole-blue is a name sometimes given to a colour obtained from archil.

Turnspit. See DACHSHUND.

Turnstone (*Strepsilas*), a small genus of birds of the plover family (Charadriidæ), intermediate between the true plovers and the sandpipers. The Common Turnstone (*S. interpres*) appears in



Turnstone (*Strepsilas* or *Arenaria interpres*).

Britain as a winter migrant, but is not known to nest. Its chief breeding-places are the shores of the Arctic Ocean in Europe, Asia, and America, but it also breeds on the coasts of Scandinavia down to Denmark. It lays four eggs of a greenish-gray colour, spotted and streaked with bluish-ash and brown, in a shallow depression lined with a few dry leaves and bents. In winter the turnstone is found on the seashore all over the world, being probably the most cosmopolitan of all birds. It derives its name from its habit of turning over stones with its bill in search of its food, which consists of small crustaceans and molluscs. The common turnstone is 9 inches in length, and is handsomely marked with black, white, and chestnut; the last-named colour is reduced in autumn, when the plumage becomes duller; the legs and feet are orange. Another species, the Black-headed Turnstone (*S. melanocephalus*), breeds in Alaska and winters in California. Allied is the litoral Surf-bird (*Aphriza virgata*), which nests above the tree-line in Alaska.

Turpentine is a semi-solid resinous substance secreted by various coniferous trees. The name turpentine is commonly understood to mean the product of the Scotch pine, the swamp pine of America, and the *Pinus maritima* of France. Venice turpentine is obtained from the larch, and Chian turpentine from the 'Turpentine-tree' (see PISTACIA); but from a commercial point of view they are practically unused. The chief supplies of turpentine are obtained from America, and to a less extent from France. Cavities are cut through the bark and into the wood about one foot from the ground, and the bark hacked a little above. The exuded turpentine runs into these cavities, commencing to flow in May, and if the bark is hacked a little higher up every ten days a constant supply is obtained throughout the summer. In consequence of the necessity of injuring the bark at a higher and higher point, in the course of years the hacking

takes place at a height of 12 to 15 feet, the tree remaining productive for about fifty years. The first year's yield is the purest, having the shortest distance to run down the trunk into the cavity; but afterwards a portion concretes as it passes down, and constitutes the common frankincense or *gum thus* of commerce (for true frankincense see BOSWELLIA, FRANKINCENSE, OLIBANUM). The turpentines are mixtures of resin and essential oil. The latter, amounting to from 15 to 30 per cent., consists chiefly of hydrocarbons having the chemical formula $C_{10}H_{16}$. When distilled along with water the oil of turpentine passes over, and the Resin (q.v.) or rosin remains behind.

Oil of Turpentine does not always possess the same properties. Its boiling-point ranges from 305° to 341° (152° to 172° C.), and the specific gravity from ·856 to ·870. Some samples rotate the plane of polarisation to the right, and others to the left. These variations are due to the presence of different isomeric compounds. Oil of turpentine, or turpentine as it is often called, is a powerful solvent of resins and oils, and is much employed in the manufacture of varnishes and oil paints. It is very inflammable, and unites with chlorine so energetically as to burst into flame when brought in contact. When air is passed through it it becomes powerfully antiseptic. Applied to the skin it acts as a local irritant, and is much employed in the treatment of rheumatism, &c. When agitated with sulphuric acid and allowed to separate it yields on distillation a fragrant liquid, terebene, which is much employed as an antiseptic and internally in the treatment of coughs.

Turpin, Archbishop of Reims, friend and companion of Charlemagne, the supposititious author of the *Historia Karoli Magni et Rotholandi.* According to Gaston Paris, this falls into two parts: the first (*c.* 1050) dealing in five chapters with Charlemagne's conquest of Spain without reference to Roland; the second (early in 12th century) giving the legend of Roland, the treachery of Ganelon, Roland's heroic death at Roncevaux, and the king's vengeance upon the Saracens. In the *Chanson de Roland* itself Turpin dies beside its hero, and is buried with him and Oliver at Blaye near Bordeaux. There was actually an Archbishop Tilpinus of Reims (753–800); but there can be no doubt that the romance in its present form was put together in the first third of the 12th century, most probably with a view to the glory of St James of Compostela. From internal evidence it has seemed to critics highly probable that Pope Calixtus II. either wrote or at least inspired the work himself while yet Guy de Bourgogne, Archbishop of Vienne. The conclusion of Gaston Paris in his admirable work, *De Pseudo-Turpino* (1865), however, is that the first five chapters were written in Galicia, before the pretensions of Compostella had risen so high as they did towards the end of the 11th century; that the remaining chapters are too secular and too little in harmony with Galician traditions to have been written, or even formally sanctioned, by Calixtus; and that the epistle sometimes appended, bearing the name of that pope, is a manifest forgery. He goes on to state that the archbishop of Vienne, after the death of his brother in 1108, visited Compostella, and conjectures that one of his train found the first five chapters there, and that the remaining chapters were adapted from various French chansons by a monk of St André at Vienne. Reinhart P. A. Dozy, in the third edition of his *Recherches sur l'Histoire et la Littérature de l'Espagne pendant le Moyen Age* (1881, tome ii.), concludes that these five chapters have been written by a Frenchman, and that subsequently to 1131; that chap. xx. is due to one of the clergy of Compostella, who wished to push its claims against Toledo for the primacy of Spain, perhaps between 1120 and 1124, perhaps much later; and that chap. ix. names three Mohammedan princes of Spain and Africa who flourished respectively in 1106–43, 1116–23, and 1125–38. Gaston Paris in *Romania* (tome xi. July 1882) accepts most of Dozy's conclusions, admits that the five chapters were written by a Frenchman at Compostella after 1069, but is reluctant to place them much later than 1100. He finally conjectures that the whole work may have been completed towards 1150 by Aimeri Picaud, the author of the Itinerary to Compostella.

The chronicle was printed by Simon Schard in *Germanicarum rerum IV. vetustiores chronographi* (Frankf. 1566), and by Justus Reuber in his *Veteres Scriptores* (Frankf. 1584); but the edition now generally used is that of Sebastiano Ciampi (Florence, 1822). An edition was prepared under the auspices of the Montpellier Société pour l'Étude des langues Romanes, by Ferdinand Castets (Montpellier and Paris, 1880). See Gaston Paris, *De Pseudo Turpino* (Paris, 1865); also the excellent account in H. L. D. Ward's *Catalogue of Romances in the Department of Manuscripts in the British Museum* (vol. i. 1883).

Turpin, DICK, born at Hempstead, Essex, in September 1705, was, successively or simultaneously, a butcher's apprentice, cattle-lifter, smuggler, housebreaker, highwayman, and horse-thief. He was hanged at York on 10th April 1739 for the murder of an Epping keeper, besides which he had accidentally shot his comrade, King. The myth of his ride to York, widely current through Ainsworth's *Rookwood*, belongs, if to any one, to 'Swift John Nevison,' who in 1676 is said to have robbed a sailor at Gadshill at 4 A.M., and to have established an 'alibi' by reaching York at 7.45 P.M. that same evening.

Turquoise (i.e. 'the Turkish stone;' spelt also *turkis*, as by Tennyson, and *turqueis*), an ornamental stone, essentially a phosphate of alumina, but containing also a little oxide of iron and oxide of copper. It is harder than felspar, but softer than quartz, and has a greenish-blue colour, and occurs as thin veins in slate rock. It is opaque, or sometimes translucent at the edges. The true oriental turquoise is found only near Nishapur in the Persian province of Khorassan. Old mines no longer worked are found in the Sinaitic peninsula; and of late Mexico produces good turquoises. A famous one, which once belonged to Nadir Shah, was two inches long, and was offered for sale at Moscow in the 18th century for £780. The name *Callaite* has been given to turquoise.—Fossil turquoise or *odontolite* is simply the fossil ivory of the Mammoth (q.v.), coloured blue by phosphate of iron, a blue which seldom fades. A mineral very like a greenish turquoise is found in Brittany, and has been named *Variscite.* It is sometimes called Oriental Turquoise; whilst the name Occidental Turquoise is given to a substance of similar colour, found near Simon, in Languedoc, which is said to be merely bone coloured with phosphate of iron.

Turretin, a distinguished family of theologians of Geneva, descended from Francesco Turretini, who emigrated for conscience' sake from Lucca to Geneva in 1579. His son, Benedict Turretin (1588–1631), became pastor at Geneva in 1612 and professor in 1618.—His son, François Turretin (1623–87), laboured at Geneva as pastor to the Italian congregation, and from 1653 as professor of Theology. He took a principal part in originating the Helvetic Consensus, and wrote a meritorious *Institutio Theologiæ Elenchticæ* (Gen. 1679–85; 3 vols. Edin. 1847–48).—His son, Jean Alphonse, often called Turretin the Younger, and by far the greatest of the name, was born in Geneva in 1674. He studied theology there under Tronchin, visited

Leyden, next both Oxford and Cambridge, and on his return became pastor of the Italian congregation, in 1697 professor of Church History, in 1705 of Theology. Throughout life he laboured to promote a union of the Reformed and Lutheran Churches (the aim of his *Nubes Testium*, 1729), and succeeded in abolishing the Helvetic Consensus in 1725. His famous large-minded *Discourse concerning the Fundamental Articles in Religion* was translated at London so early as 1720. He died at Geneva 1st May 1737, in which year was published his *Cogitationes et Dissertationes Theologicæ* (2 vols.). See the biographical study by E. de Budé (Lausanne, 1880).

Turret Ship. See NAVY.

Turtle (a corruption of *tortoise*, or of the Spanish *tortuga*, 'a tortoise'), any tortoise, but especially the edible Green Turtle (see TORTOISES AND TURTLES), prized for the soup made from its flesh, chief glory of aldermanic banquets. *Calipash* is the part of the animal that belongs to the upper shield, a fatty gelatinous substance of a dull greenish colour; *calipee*, the yellowish meat of the lower shield. 'Mock Turtle' is made of calf's head in lieu of turtle meat.

Turtle-dove (*Turtur*), a genus of Columbidæ, of graceful build, with small head and slender bill, long wings, and long rounded tail. The genus includes about thirty species, all of which are confined to the eastern hemisphere. The Common Turtle-dove (*T. vulgaris*, also called *Streptopelia turtur*) is abundant all the year round in the warmer parts of Europe and Asia, but is only a summer visitor in the colder parts. It is found in the south-eastern counties of England during the summer months, and occasionally further north, or even in the south of Scotland. The nest, a very rough loose structure of twigs, is placed on a branch or fork of a tree at no great distance from the ground. Two eggs are laid at a time, and the male shares in hatching and rearing the young. The food of the turtle-dove consists chiefly of seeds and soft shoots. The turtle-dove is a vigorous bird, far from being always gentle; it has a high circling nuptial flight and a deep vibrating note; it is protected from birds of prey by its power of flying almost noiselessly in and out among the trees even in the thickest part of a forest. Its plumage, though not so brilliant as that of the true pigeons, is very beautiful, the various tints of reddish-brown and gray shading softly into each other; the head and neck are blue, the tail-feathers tipped with white. Their beauty of form and colour, their soft cooing, and their affection towards each other and their young have made this and other species of turtle-dove favourite cage-birds. They are easily tamed, breed readily in captivity, and have been known to live as long as fourteen years. The common cage-turtle-dove, *Turtur risorius*, is an import from the East. See PIGEON.

Tus. See MESHHED.

Tuscaloosa, once the capital of Alabama, 55 miles by rail SW. of Birmingham, is the seat of the state university and insane asylum, and has various colleges. Pop. 12,000.

Tuscania, a city of southern Etruria, 15 miles W. of Viterbo. It is of Etruscan origin, and was known by its mediæval name of Toscanella until 1911. It has picturesque mediæval walls and buildings, but is mainly remarkable for the very fine Romanesque churches of S. Pietro and Sta. Maria Maggiore (8th–12th cent.), which have considerable importance in the history of architecture. Pop. 5000.

Tuscan Order, in Architecture, the simplest of the five classic orders, being a Roman modification of the Doric style with unfluted columns, and without triglyphs. See COLUMN.

Tuscany, formerly a sovereign grand-duchy in the west of Italy, lying for the most part, but not wholly, south and west of the Apennines, with an area of 9291 sq. m. Pop. (1860) 1,800,000; (1881) 2,208,869; (1901) 2,548,154; (1921), 2,830,184. The north and north-east of the country is filled with mountains, whence numerous rivers and streams flow down to the sea, the most important of which is the Arno. This district is also the source of the Tiber (q.v.). The rest of Tuscany is an undulating region of hills and dales, except the coasts, which are flat and marshy (see MAREMMA). It is mainly agricultural. The nine provinces of Tuscany, as a *compartimento* of the kingdom, are Arezzo, Firenze (Florence), Grosseto, Lucca, Livorno (Leghorn), Massa e Carrara, Pisa, Pistoia, and Siena. See ITALY and separate articles. Its ancient history is described at length in the article ETRURIA, and its mediæval history in the article FLORENCE (cf. also ITALY). It is only necessary to add that modern Tuscany was first constituted in its present dimensions in 1567, when Cosimo III. de' Medici became grand-duke. On 27th April 1859, the national assembly of Tuscany pronounced the deposition of the reigning dynasty, and declared for annexation to Sardinia; and in March, 1860, it was declared part of the new kingdom of Italy.

Tuscaroras, a tribe of Indians who were driven out of North Carolina by the settlers in 1715, and joined the Iroquois (q.v.).

Tusculum, an ancient city of Latium, about 15 miles S. of Rome, was situated on a ridge forming part of the outer crater ring of the Alban group of hills. If we accept the traditional account, Octavius Mamilius, ruler of Tusculum, married a daughter of Tarquinius Superbus, and played a conspicuous part in the last of the great struggles made by the banished tyrant to regain his kingdom. But the Latins were so thoroughly beaten at Lake Regillus (497 B.C.) that the predominance of Rome was established. As early as 381 B.C. the inhabitants of Tusculum received the Roman franchise. Towards the close of the republic Tusculum and its neighbourhood became a favourite country residence of the wealthy Romans; Lucullus, Cato, Brutus, Hortensius, Crassus, Cæsar, and Cicero had villas in its territory, and many remains of such villas exist; and here the great orator composed his *Tusculanæ Disputationes*. In 1191 Tusculum was stormed by the Romans and ruined for ever; lower down arose the town of Frascati (q.v.). The amphitheatre, theatre, and other buildings of ancient Tusculum remain, including the massive walls and arches which once supported one of its temples, wrongly believed to be an ancient villa, and often attributed to Cicero. On the citadel there are ruins of mediæval houses.

Tusculum, a small town in the NE. of Tennessee, U.S., with a small school notorious for granting various kinds of university degrees freely.

Tusk. See TORSK.

Tuskar Rock, 7 miles NE. of Carnsore Point, on the coast of Wexford, has a lighthouse 110 feet high, with a light visible for 15 miles.

Tuske'gee, or TUSKEEGEE, capital of Macon county, Alabama, 38 miles E. of Montgomery, with a normal and industrial institute for negroes, founded by Booker T. Washington (q.v.), and a veterans' hospital for negroes. Pop. 2500.

Tussaud, MADAME, the foundress of the well-known exhibition of wax-work in London, was born (Marie Grosholtz) at Bern in 1760, and learned

the art of modelling in wax in Paris. For a time she was engaged in giving lessons in modelling to Elizabeth, sister of Louis XVI., and in this way became acquainted with the leading personages at court. Imprisoned for three months during the Revolution, in 1802 she established herself in London, where she died 16th April 1850. Madame Tussaud's exhibition was destroyed by fire in 1925, when the wax figures melted. Part of the 'Chamber of Horrors' survived the fire, and reconstruction followed. See the Life by Hayley (1878), and *The Romance of Madame Tussaud's* by her grandson J. T. Tussaud (1919).

Tusser, THOMAS, in Fuller's phrase, 'successively a musician, schoolmaster, serving-man, husbandman, grazier, poet, more skilful in all than thriving in any vocation,' was born at Rivenhall in Essex about 1524. After serving as a chorister in the chapel of Wallingford Castle, and at St Paul's, he went to Eton, where he was whipped by Udall, was elected in 1543 to a scholarship at King's College, Cambridge, but soon afterwards removed to Trinity Hall, where he tells us that he dwelt trimly and passed his time joyfully with a number of learned men. After a residence at court as a retainer of Lord Paget, he married and settled as a farmer at Cattiwade, near East Bergholt, in Suffolk, where he compiled his famous work, *A Hundreth Good Pointes of Husbandrie* (1557). Quarrelling with his landlord, Tusser left his farm, and became a lay clerk in Norwich Cathedral, which post he again gave up for a farmer's life. He died in London about April 1580, and was buried in the church of St Mildred in the Poultry. Tottel published in 1573 an edition of his book enlarged into *Five Hundreth Pointes of Good Husbandrie*, with a curious metrical autobiography. Warton says well that this old English Georgic has much more of the simplicity of Hesiod than of the elegance of Virgil, still it reflects in a pleasing manner the simpler virtues of the good old times.

Editions are by Dr W. Mavor (1812), Arber (1873), and the English Dialect Society (1879).

Tussila'go, a genus of Compositæ. *T. Farfara*, or Colt's-foot, is the only British species. It has single-headed scaly scapes, appearing before the leaves in early spring, the flowers yellow, both disk and ray; the leaves heart-shaped, angular. The leaves have a somewhat glutinous and subacrid taste, and are used either by smoking or in a decoction for relief of asthmas and troublesome coughs. They are clothed on the under side with cottony down, formerly used as tinder. The feathery pappus-hair which succeeds the flowers is eagerly sought by goldfinches to line their nests. Nearly allied to this genus is Petasites (see BUTTER-BUR).

Colt's-foot (*Tussilago Farfara*).

Tussock Grass, or TUSSAC GRASS, a plant bewildering in its synonymy, has been named *Poa flabellata*, *P. cæspitosa*, *Dactylis cæspitosa*, *Festuca cæspitosa*, *F. antarctica*, *F. flabellata*. The first of these names is accepted by the authors of the *Index Kewensis*. This grass, in conjunction with *Festuca rubra*, forms the tussock meadows, the home of those vast flocks and herds on which the prosperity of New Zealand largely depends. It is also of great importance in the Falkland Islands. It is remarkable for forming great tufts, sometimes 5 or 6 feet in height, the long tapering leaves hanging over in graceful curves, from 5 to 8 feet long, and an inch broad at the base. It is, however, sufficiently delicate to be very good food for horses and cattle; and it has been tried with success in the Hebrides, Orkney Islands, and other localities in which there is a peaty soil exposed to winds loaded with sea-spray. The inner part of the stem a little above the root is soft, crisp, flavoured like a hazel-nut, and often eaten by the inhabitants of the Falkland Islands. The young shoots are boiled and eaten as asparagus. Another grass, Blue-tussock (*Poa Colensoi*) forms much smaller tussocks, but is nevertheless a most valuable economic grass.

Tussock Grass.

Tussock Moth (*Dasychira pudibunda*), a grayish-white moth about an inch long, the caterpillars of which do great mischief in hop grounds, and are known as Hop-dogs. The caterpillar is delicate green in colour, with brush-like tufts of yellow hairs on several of the segments. It feeds on leaves throughout the summer, becomes a hairy chrysalis about September, and emerges as a moth in the following spring. Miss Ormerod recommends a hard-syringing if the caterpillars are present in large numbers.

Tussock Moth and Caterpillar.

Tutankhamen was one of the last Pharaohs of the 18th dynasty. He was the son-in-law of Akhenaten, the heretic king, and succeeded to the throne after the death of Smenkh-ka-ra, another of the sons-in-law of Akhenaten. He became king at the age of twelve, and died when eighteen, about 1340 B.C. The confusion and chaos consequent on Akhenaten's seventeen years of misrule gave the boy-king little opportunity to distinguish himself, and he is known to history only by the splendour of his burial and by the fact that he returned to the ancient religion,

which Akhenaten had forsaken, and so ended the heresy which had gone far to ruin the country.

The tomb of Tutankhamen was discovered in 1922 by Lord Carnarvon and Mr Howard Carter. It is the only untouched royal tomb found in Egypt, and shows the magnificence which surrounded the burial of a Pharaoh. The tomb is entered by a descending flight of sixteen steps which lead to a large chamber, known as the 'ante-chamber'; from this the actual burial-chamber of the king is entered. This is a small room, and here lay the body of Tutankhamen enclosed in a coffin of pure gold inlaid with precious stones and coloured faience. The golden coffin was enclosed in two wooden coffins, which lay in a stone sarcophagus, and the sarcophagus was the centre of a 'nest' of shrines richly carved, gilded, and inlaid. Over the face of the mummy was a gold portrait-mask, the details of which were inlaid with lapis lazuli, turquoise, carnelian, obsidian, and brilliantly-coloured faience; on the head was a royal diadem in the form of a fillet with streaming ends, and decorated over the brow with the heads of a vulture and a cobra, the emblems of sovereignty; this was also of gold, with inlay of stones and coloured faience. The tomb consists of four rectangular chambers, the ante-chamber, from which a smaller chamber, called the 'annexe,' is entered; the burial-chamber also leads out of the ante-chamber; and from the burial-chamber leads the 'store-room.' The ante-chamber, the annexe, and the store-room were filled with the funerary possessions of the king. These consist of statues and statuettes of the king himself, as well as of the protective gods and goddesses; and the burial furniture included beds, stools, chairs, and boxes, all carved, painted, or covered with thick sheet-gold, and inlaid with many-coloured stones. The most beautiful of the caskets was painted in delicately-drawn designs of hunting and warfare. The chariots had been taken to pieces, and lay in a confused heap of wheels and trappings; they also were of wood, covered with gold and inlay. The jewellery consists of pectorals of gold with inlay of coloured stones, necklaces and bracelets of stone and faience beads, amulets of gold and stone, and finger-rings. The wealth of the funeral-offerings shows that Egypt was still the richest country in the ancient world, and that the favour of her Pharaohs was sought by the neighbouring princes with rich gifts of gold, precious woods, and jewels.

Tutbury, in Staffordshire, on the river Dove, 6 miles by rail NW. of Burton-on-Trent, has the ruins of the pre-Norman castle where Mary, Queen of Scots, was twice imprisoned.

Tuticorin (*Tuttukudu*), an important port of Madras, 35 miles E. of Tinnevelli by rail, with cotton factories, pearl-fisheries, and Catholic missions. It exports cotton, chillies, tea, &c. Pop. (1921) 44,522.

Tutor, in the law of Scotland, means a guardian of the person as well as of the estate of a boy under fourteen, or a girl under twelve: that is, while they are in a state under that of puberty. See GUARDIAN, INFANT.

Tuttlingen, a town of Württemberg, on the Danube, 20 miles WSW. of Sigmaringen, with some manufactures. Here in 1643 an Austro-Bavarian force defeated the French. Pop. 16,000.

Tutuila. See SAMOA.

Tver, a Russian town at the confluence of the Volga and Tvertsa, 100 miles NW. of Moscow by rail. There are manufactures of cottons, hosiery, and nails. Pop. 86,000.

Twain, MARK. See CLEMENS (S. L.).

Tweed, the noblest of Scottish rivers, rises far up in Peeblesshire at Tweed's Well, 1250 feet above sea-level, and flows 87 miles north-eastward, eastward, and again north-eastward, through or along the boundaries of Peeblesshire, Selkirkshire, Roxburghshire, Berwickshire, and Northumberland, till it falls into the North Sea at Berwick-on-Tweed. It receives Ettrick Water (itself fed by Yarrow), Gala Water, the Leader, the Teviot, the Till, the Whitadder, and a number of lesser tributaries; is tidal for 10 miles, but almost quite unnavigable; and traces the English border for only about 17 miles, so that 'North of the Tweed' is a none too accurate phrase. It is famous for its salmon-fisheries, but more famous far for its memories: 'which of the world's streams,' asks George Borrow, 'can Tweed envy, with its beauty and renown?' For it flows by Neidpath, Peebles, Traquair, Ashiesteel, Abbotsford, Melrose, the Eildons, Bemersyde, Dryburgh, Kelso, Coldstream, and Norham Castle; nor are these a tithe of Tweedside's historic scenes. Merlin, Thomas of Ercildoune, and Michael Scott—the Tweed has dim legends of these; and its ripple was the last sound heard by a fourth and a mightier wizard than any of them all, Sir Walter.

See Dick Lauder's *Scottish Rivers*, and books on the Tweed by Veitch (1884) and Sir H. Maxwell (1905).

Tweed, 'BOSS.' See TAMMANY SOCIETY.

Tweedmouth. See BERWICK-ON-TWEED.

Tweeds. See WOOL.

Twelfth-day, the twelfth day after Christmas, the feast of the Epiphany (q.v.), was once a time of great popular festivities, originally designed to honour the Three Kings (see MAGI). One of the chief features was the choosing of a king of the feast by means of a bean hidden in the *Twelfth Cake*. When on the eve of the feast this cake was cut up and distributed, the person in whose portion the bean was found was king—hence called Bean-king. This choosing of a king by means of a bean was in use at some other festivals also.

Twelve Patriarchs, TESTAMENTS OF THE, a work of the 2d century after Christ, in which, on the model of Jacob's blessing of the tribes in Genesis xlix., discourses and prophecies of Christ are put into the mouths of the fathers of Israel. There are monographs on it by Vorstmann (1867), Sinker (1879), Schnapp (1884), and Charles (1908).

Twelve Tables (Lat. *Lex Duodecim Tabularum*), the name given to the earliest code of Roman law, civil, criminal, and religious, made by the decemvirs in 451–449 B.C. (A.U.C. 302–304). These, originally comprised in ten tables, to which next year two others were added, were supposed to form the basis of all Roman law, and in Cicero's time were still committed to heart by boys at school. But they were very far from being a complete system. The occasion for them arose in the constant complaints made by plebeians of oppression by patricians; and the principal aim of the twelve tables was to define rights, fix penalties, and prevent oppression under legal forms. Some of them were based on Greek models; most of them were derived from earlier Roman legislation. But laws about which there was no dispute were not included; thus they did not deal with the family, the succession, or ordinary legal procedure, and contained little of customary law. Many older laws were left intact by them, and reappear in Justinian's code. To the original tables commentaries were from time to time added. It is probable that the original bronze tablets on which the laws were written perished in the sack of Rome by the Gauls in 390 B.C.; copies of them stood in the forum in the 2d century A.D. Of the text we possess only fragments edited by Schöll (1866), Voigt (1884), and

Godefroy; see also Wordsworth's *Fragments* (1874), Ortolan's *History of Roman Law* (trans. 1871), and Muirhead's *Historical Introduction* (1886).

Twickenham, a municipal borough (1926) of Middlesex, on the north bank of the Thames, 11½ miles SW. of London. It is a place of many villas, and has been the residence of many notabilities—Catharine of Aragon, Bacon, Clarendon, Kneller, Pope (who is buried in the church), Horace Walpole (Strawberry Hill still remains, although a good deal altered), Kitty Clive, several of the Orleans family, J. M. W. Turner, Tennyson, &c. Pop. (1851) 6254; (1921) 34,805. See R. S. Cobbett's *Memorials of Twickenham* (1872).

Twilight. If the earth had no atmosphere we should be involved in total darkness from the instant of sunset till the instant of sunrise. The transition from day to night, and from night to day, is gradual and occupies an interval which varies with the latitude and the declination of the sun, and this intermediate stage is called twilight. It is caused by the reflection of sun-light from the upper portion of the earth's atmosphere, and is defined somewhat arbitrarily as ending or beginning when the sun is 18° below the horizon. In latitude 40° twilight lasts from 1½ to 2 hours, depending on the season of the year. North of latitude 50° twilight near midsummer lasts all through the night. The question of the duration of twilight is, therefore, simply reduced to this: How long after sunset, or before sunrise, does the sun reach a position 18° below the horizon of a given place? And this can be answered easily by calculation in spherical trigonometry.

Twill, a woven fabric, in which the warp is raised one thread, and depressed two or more threads for the passage of the weft: this gives twill a curious appearance of diagonal lines.

Twining, THOMAS, translator of Aristotle's *Poetics*, was born the son of a prosperous tea-merchant in 1734, but, preferring study to business, entered Sidney Sussex College, Cambridge, and graduated B.A. in 1760. He took orders, and became in 1768 rector of White Notley in Essex, in 1770 also of St Mary's, Colchester. A pious and scholarly man, of wide reading and good critical powers, he discharged his clerical duties with zealous honesty, finding his solace in music, letter-writing, and travelling over England, and died, after a well-spent life, 6th August 1804. His translation of the *Poetics* of Aristotle—a sound piece of scholarship—appeared in 1789. His great-nephew published in 1883 a selection from his correspondence under the title *Recreations and Studies of a Country Clergyman of the 18th Century*. Its success induced a further book, the much less interesting *Selections from Papers of the Twining Family* (1887), the chief contributor in which is not the clergyman, but his brother, Richard Twining, head of the tea-business.

Twinkling. See SCINTILLATION.

Twiss, SIR TRAVERS, jurist, was born in Westminster, 19th March 1809, and was educated at University College, Oxford. Successively fellow and tutor of his college, a public examiner at Oxford, professor of Political Economy at Oxford (1842–47), and of International Law in King's College, London (1852–55), he became in 1855 professor of Civil Law at Oxford. In 1858 he became Chancellor of the Diocese of London, in 1862 Advocate-general of the Admiralty, Queen's Advocate-general in 1867, being knighted that same year. He served also on various royal commissions. He resigned all his offices in 1872, but thereafter in 1884 drew up for the Belgian King Leopold II. a constitution for the Congo Free State, and in 1885 acted as legal adviser to the West African Conference at Berlin. He died on the 14th January 1897. His writings rank admittedly among the most authoritative on questions of public and international law. Among the most important are *View of the Progress of Political Economy since the 16th Century* (1847), *Lectures on International Law* (1856), *The Law of Nations* (1861), *Law of Nations in Times of War* (1863), *Monumenta Juridica: The Black Book of the Admiralty* (4 vols. 1871–76), an edition for the Rolls series of the *De Legibus et Consuetudinibus Angliæ* of Henry de Bracton (6 vols. 1878–83), and *Belligerent Right on the High Seas* (1884).

Tyana, APOLLONIUS OF. See APOLLONIUS.

Tyburn. See LONDON, and EXECUTION.

Tye, CHRISTOPHER, English musician, was born at Westminster about 1500, was educated in the King's Chapel, and was musical instructor to Edward VI. He received his Mus. Doc. from Cambridge in 1545, from Oxford in 1548. Under Elizabeth he was organist to the Chapel Royal, and produced various fine services and anthems.

Tyldesley, a town of Lancashire, 10 miles NW. of Manchester, with cotton-mills and collieries. Pop. with Shakerley (1921) 15,651. It is part of Leigh parliamentary borough.

Tyler, JOHN, tenth president of the United States, was born in Charles City county, Virginia, March 29, 1790, graduated at William and Mary College in 1807, and two years later was admitted to the bar. He sat in the state legislature from 1811 till 1816, when he was chosen to fill a vacancy in congress. He was returned in 1817, and again in 1819, and distinguished himself as a strict constructionist, opposed protection, and, on the Missouri question, denied the right of congress to limit the extension of slavery, or to control it at all in the territories. In 1825–26 he was elected governor of Virginia, and in December 1826 a United States senator—partly by the votes of Clay's supporters; but in the senate he pursued an independent course, and, while in 1832 he supported Jackson rather than Clay for the presidency, in February 1833 he was the only senator who recorded his vote against the 'force bill' granting extraordinary powers to the president in dealing with South Carolina (see JACKSON). And yet Tyler disapproved of Nullification (q.v.); only he disapproved still more of arbitrary and unconstitutional action on the part of the federal executive. This motive accounts for his action also in the case of the United States Bank (see JACKSON). He had denounced its existence from his first entrance on a public career; but he resented the despotic methods by which Jackson overthrew it, and he supported Clay's motion to censure the president, and, declining to obey instructions to vote for expunging this motion from the minutes, in 1836 resigned his seat. In 1840 he was elected vice-president of the United States, with General Harrison as president. President Harrison died April 4, 1841, a month after his inauguration, and by this event Tyler became president. In the first year of his administration he had to face a struggle with the Whig majority in congress and the senate, headed by Clay, who regarded the result of the election as a victory for them and for the project of a re-established national bank. Two bills were passed to this end, and both, in spite of the storm raised, were vetoed by the president. After the second veto, in September 1841, all his cabinet except Daniel Webster resigned; and Webster followed the rest in 1843, his place being taken in 1844 by John C. Calhoun. But victory lay with the president, whose firmness utterly and finally destroyed the project, and with it the notion of paternal government. In 1842 he vetoed two pro-

tective bills providing for a distribution of the surplus revenues among the states. Besides the Ashburton (q.v.) treaty, the most important act of his administration was the annexation of Texas, in March 1845. At the close of his term of office he retired to Virginia and to private life until 1861, when he was president of a peace convention at Washington. Failing in his efforts at a compromise, he gave his adhesion to the Confederate cause, and was a member of the Confederate congress until his death, at Richmond, January 18, 1862. See his son's *Letters and Times of the Tylers* (2 vols. Richmond, 1884–85).

Tyler, WAT, leader of the peasant revolt of 1381. According to the traditional story, an insult offered by a tax-gatherer to the daughter of Walter the Tyler (a tiler of roofs or a maker of tiles) at Dartford in Kent led to the outbreak. Wat brained the tax-gatherer; and under Wat and Jack Straw the populace rose throughout Kent and Essex. Their first act was to liberate John Ball, who lay in Maidstone prison for preaching heresy and social reform, and then they marched on London. The several causes of the rebellion, its brief course, and its swift and summary suppression, with the death of Wat at the hands of Lord Mayor Walworth, are treated at RICHARD II.

Tylor, SIR EDWARD BURNETT (1832–1917), an eminent anthropologist, was born at Camberwell, and had his education at the Friends' school, Grove House, Tottenham. Meeting the ethnologist Henry Christy in Cuba in 1856, he accompanied him on a scientific journey through Mexico, one result of which was his *Anahuac, or Mexico and the Mexicans* (1861). An F.R.S. (1871), he was appointed keeper of the Oxford University Museum (1883), Reader in Anthropology (1883), and Professor of Anthropology (1895). He was in 1888 Gifford lecturer at Aberdeen, and became president of the Anthropological Society in 1891. His *Researches into the Early History of Mankind* (1865) and *Primitive Culture* (2 vols. 1871; 6th ed. 1920) stand first among works of their class, in learning, arrangement, grasp of principles, and breadth of view. The foundation of his philosophy of man is involved in the new sense which he gave to the word Animism (q.v.). One of the best introductory handbooks to a subject ever written is his *Anthropology* (1881). He was knighted in 1912. See the Festschrift of 1907.

Tympanum. See EAR.

Tynan, KATHARINE, born in Dublin in 1861, was educated in a convent. In 1893 she married Mr H. A. Hinkson. Since 1885 she has written many volumes of novels and verse, besides the autobiographical *Twenty-five Years, Middle Years,* and *Years of Shadow.*

Tyndale, WILLIAM, memorable in the history of the English Bible, apparently a native of Gloucestershire, born about 1484 most probably at Slymbridge, or perhaps at Melksham Court in Stinchcombe parish, or at Hunt's Court, North Nibley. He had his education first at Oxford—at Magdalen Hall, says unvarying tradition—and graduated B.A. in 1512. His name occurs in Boase and Clark's *Register of the University of Oxford* (1884–88) as William Hychyns—a name said to have been assumed by his great-grandfather, by which as well as Tyndale he is described in official documents. It is probable enough that at Oxford he may have been influenced by the disciples of Colet, who himself lectured here till 1505, and it is still more probable that he was attracted to Cambridge by the fame of Erasmus, who lived there from about 1510 to 1514. He left Cambridge most probably about the close of 1521 to become chaplain and tutor in the household of Sir John Walsh of Old Sodbury in Gloucestershire. His sympathy with the new learning soon aroused suspicion, and in 1523 he went up to London, where he was hospitably entertained in the house of Humphry Monmouth. He was already a competent Greek scholar, and in his unsuccessful application to Tunstall, Bishop of London, he carried with him a translation of part of Isocrates as a recommendation. In the spring of 1524 he went to Hamburg, probably made his way thence to Wittenberg, next in the autumn of 1525 to Cologne, and there, with the help of a Franciscan friar named William Roye, and another, began with Quentel in 1525 the printing of his English New Testament in an impression of 3000 copies in quarto size. This had not proceeded beyond the gospels of Matthew and Mark when the officious intrigues of Cochlæus forced Tyndale to flee to Worms, where, instead of completing Quentel's unfinished work, Peter Schoeffer printed for him another impression of 3000 copies in a small octavo size, without prefaces to the books or annotations in the margin. The quarto was completed soon after, most probably also by Schoeffer, with general introduction, prologues, inner marginal references, and outer marginal glosses, these last largely taken from Luther's version of 1522, the references especially being faithfully copied in many cases even to the errors. The translation itself owed much to Luther, much also to the 3d ed. (1522) of the Greek Testament of Erasmus with its Latin translation. Tunstall and Warham denounced the book, hundreds of copies were bought up and burned by their authority, but in both forms it made its way by the summer of 1526 to the hearts of Englishmen, and the strong simplicity and homely vigour of its style established a standard of biblical translation into English, and bequeathed its phrases imperishable to all posterity. By 1530 as many as six editions, of which three were surreptitiously printed at Antwerp, had swiftly and silently been dispersed, yet, says Westcott, so fierce and systematic was the persecution that of these six editions, numbering perhaps 15,000 copies, there remains of the first quarto fragment but one copy, and that imperfect (Grenville Library, Brit. Mus.; fac-simile Oxford, 1926, with introduction by A. W. Pollard), of the first octavo but two, one incomplete (in St Paul's Cathedral Library), the other wanting only the title-page (in Baptist College, Bristol; fac-simile by Mr Francis Fry, 1862), and of the others but two or three copies, and these not satisfactorily identified.

Meantime Tyndale continued to toil indefatigably at the labour of his life. In 1530 he published at Malborow (Marburg) by Hans Luft his version of the *Pentateuch* (reprinted by Rev. Dr J. I. Mombert, 1885), where the marginal glosses, almost all original, contain many violent attacks on the pope and the bishops, full of rich satire, irony, and even humour. It is scarcely possible, *pace* Dr Mombert, that Tyndale could have found time to master Hebrew very thoroughly, and we find that here, still more than in his New Testament, he leans heavily on Luther. Later, in 1531, appeared his version of *Jonah*, with a prologue (fac-simile by Fry, 1863). An unauthorised revision of Tyndale's New Testament was made at Antwerp by George Joye in August 1534, and in November of the same year Tyndale himself issued there at the press of Marten Emperowr a revised version with short marginal notes and prologues, together with a translation of the 'Epistles taken out of the Old Testament which are read in the church after the Use of Salisbury upon certain days of the year.' These include a large number of portions from the Old Testament and the Apocrypha. One copy of this work, probably that preserved in the British

Museum, was struck off on vellum and beautifully illuminated for presentation to Queen Anne Boleyn, under whose favour apparently was printed in 1536 by T. Godfray a reprint of Tyndale's revised New Testament—the first volume of Holy Scripture printed in England. Once again, before the end Tyndale revised his Testament (1535), this time without the marginal notes, but with the innovation of headings to the Gospels and Acts, but not the Epistles. Another point of difference was a peculiarity of orthography (*maester*, *faether*, *moether*, *stoene*, *moost*, &c., 200 in all), long suspected erroneously to have been an attempt to supply provincial forms for English rustics, but more probably, as Demaus, Bishop Westcott, and Ellis held, due to the copy being read to a Flemish compositor, who gave the Flemish equivalents of the English vowel-sounds.

But now it wanted only the crown of martyrdom to consecrate the lifelong devotion of Tyndale to his task. Already the emissaries of Henry VIII. had often tried to get hold of him, or at least to discover his hiding-place. He had spent two quiet years of constant labour at Antwerp, part of the time in the house of Thomas Poyntz, when he was seized through the treachery of one Henry Philips, 24th May 1535, 'not without the help and procurement of some bishops of this realm' says Hall. For sixteen months he lay in the castle of Vilvorde, and it appears that Cromwell made some ineffectual efforts to save him. A single letter in Latin, discovered by Galesloot in the archives of the Council of Brabant, is reproduced in facsimile by Demaus, and gives a touching picture of the noble martyr sitting through the long winter nights in the cold and darkness of his dungeon, and asking above all things for a lamp and his Hebrew Bible, Grammar, and Dictionary. It is highly probable that his prayer was granted, and that before the end he had completed, according to unvarying tradition, the translation of the Old Testament to the end of the Books of Chronicles. This part of his work was printed by John Rogers, along with Tyndale's Pentateuch and New Testament, in what is usually known as Matthews' Bible. Tyndale's protracted trial was apparently not begun till 1536; on Friday the 6th October of that year he was first strangled, then burned. Foxe tells us that at the stake he cried 'Lord, open the king of England's eyes!' Eight years before he had written, 'If they shall burn me, they shall do none other thing than that I look for. . . . There is none other way into the kingdom of life than through persecution and suffering of pain, and of very death, after the ensample of Christ.'

Tyndale's chief original works were *A Parable of the Wicked Mammon* (1527); *Obedience of a Christian Man*, his most elaborate book (1528); and *Practice of Prelates* (1530), a pungent piece of controversial polemic, called forth by Sir Thomas More's *Dialogue* (1529), which he met formally with his plain and pointed *Answer* (1531). More followed next year with the first part of his long and intemperate *Confutation*, a work unworthy of its author's reputation. Tyndale's *Works* were published, together with those of his dear friend Frith, and Barnes, in folio by John Daye in 1573. His *Doctrinal Treatises and Introductions to Different Portions of the Holy Scripture* were published by the Parker Society in 1848; his *Expositions and Notes on the Holy Scriptures, together with the Practice of Prelates*, in 1849, and the *Answer to More's Dialogue* in 1850. It was fortunate for our literature that the task of translating the Bible fell to a writer with such a splendid sense of English as William Tyndale. He gave to his work an independent and ineffaceable stamp of originality, and, if later revisers of greater learning have amended his renderings, the characteristic language of the English Bible remains his own. See the admirable biography by the Rev. R. Demaus, revised ed. by Richard Lovett (1886; new ed. 1925); also Westcott's *General View of the History of the English Bible* (2d ed. 1872), and Francis Fry's *Bibliographical Description* of forty editions of Tyndale's version in English (1878); Guppy in the *John Rylands Bulletin*, July 1925.

Tyndall, JOHN, physicist, was born 21st August 1820 at Leighlin-Bridge, County Carlow, was employed for a time on the ordnance survey, and for three years was a railway engineer at Manchester. In 1847 he became teacher of physics at Queenwood College, Hampshire, where he began original researches. In 1848 he and his colleague, Dr Frankland, went to Germany and studied at Marburg (under Bunsen); and there, at Berlin, and elsewhere he made investigations into diamagnetism and the magneto-optic properties of crystals. Already an F.R.S., he was in 1853 made professor to the Royal Institution, of which in 1867 he became superintendent. In 1856 Professor Huxley and he made a visit to the Alps, which resulted in a joint work on the structure and motion of glaciers. Tyndall was the first who ever climbed the Weisshorn. In 1859 he began his important researches on radiation; a later subject was the acoustic properties of the atmosphere. In 1874 he was president of the British Association at Belfast, and by the materialist tone of his presidential address raised keen and long-lasting controversies. He was for some years scientific adviser to the Board of Trade and to the lighthouse authorities, but in 1883 retired from most of his appointments and established himself in the country (in Sussex). He was especially famous as a brilliant lecturer and as a popular exponent of modern physical science. The proceeds of a successful lecturing tour in the United States (1872) he devoted to founding scholarships for original research at Harvard and Columbia colleges. Among his honours were the LL.D. of Edinburgh and Cambridge, and the D.C.L. of Oxford. He died (from an overdose of chloral) 4th December 1893.

His works comprise *The Glaciers of the Alps* (1860); *Mountaineering* (1861); *Heat as a Mode of Motion* (1863); *On Radiation* (Rede Lecture, 1865); a volume on Light, one on Sound, one on Electricity, one on Faraday, and one on the forms of water in clouds, rivers, ice, &c.; also *Hours of Exercise in the Alps* (1873); *Fragments of Science* (5th ed. 1876); Essays on the *Floating Matter of the Air* (1881); and *New Fragments* (1892).

Tyne, a northern English river, formed by the confluence of the North Tyne and the South Tyne, a mile NW. of Hexham. It flows east for 30 miles, and enters the sea between Tynemouth and South Shields. Some of the head-streams of the North Tyne rise in Scotland, about 11 miles SE. of Hawick. It flows south across Keelder Moor, and south-east to Hexham, with a total length of 32 miles, and receives on the left the Reed Water near Bellingham. The South Tyne rises on the slopes of Cross Fell, flows 19 miles north to Haltwhistle, then 14 miles east to Hexham, receiving the Allen on the right. The scenery of the two head-streams is beautiful beyond most, and few districts of England, moreover, are richer in romantic and historical associations. The Tyne itself flows through the richest coal-mining region of Britain, and on its banks stand Corbridge, Ovingham, Newburn, Ryton, Blaydon, Newcastle and Gateshead, Walker, Jarrow, Wallsend, North and South Shields. Its chief affluents are the Derwent and the Team on the right. Navigable from Blaydon, about 8 miles above Newcastle, from that city to the sea it is one continuous harbour. The salmon-fisheries have decayed, but the shipbuilding maintains its importance. The multifarious manufactures carried on on Tyneside (which sadly defile the lower course of the stream) may be realised by referring to the article NEWCASTLE, where also the sea-borne trade and the

deepening of the river are referred to. For statistical and some other purposes, Newcastle and North and South Shields are grouped together as the 'Tyne ports.' The Tyne is also famous among English rivers for its boat-racing (see ROWING). See Guthrie's *River Tyne* (1880), Palmer's *Tyne and its Tributaries* (1881), and Cassell's *Rivers of England.*

Tynemouth, a great watering-place of Northumberland, 9 miles E. of Newcastle, occupies the angle formed by the line of the coast and the Tyne. The county, municipal, and parliamentary borough comprises the townships of Tynemouth, North Shields, Chirton, Cullercoats, Preston, Percy Main, and East Howdon. From an early period Tynemouth was a place of importance. Edwin, King of Northumbria, is said to have founded here, about 627, a church of wood, wherein his daughter Rosella took the veil. King Oswald rebuilt it of stone about 640, and probably established the monastery, which in the succeeding centuries suffered much from the hands of the Danes. It was refounded in 1090 by Mowbray, Earl of Northumberland. The monastic buildings were dismantled at the dissolution in 1539. The remains of the priory are chiefly those of the church, which was built about 1100 and enlarged about 1220. The chancel, whose eastern and southern walls are still standing, is one of the most exquisitely light and graceful specimens of Early English architecture in the country. The Lady Chapel, a chantry of the Percies, was founded towards the close of the 14th century. Tynemouth castle was built about 1296. All that remains of it now is the great gateway of 14th-century date. In the 13th century the germ of North Shields was a collection of huts or sheds temporarily used by the fishermen of the Tyne. These were called 'sheles,' a name which it is suggested has since been corrupted into 'Shields.' The prior of Tynemouth previous to 1279 built twenty-six houses and a quay here, but the burgesses of Newcastle, who claimed an exclusive right to the trade of the Tyne, frustrated his design to establish a town where, so they contended, 'no town ought to be.' For five hundred years North Shields, oppressed by Newcastle, remained a mere village, but during the 19th century its development was rapid. The town is now the most important part of the borough. As is usual in very old towns, the more ancient areas are somewhat dingy and lacking in outstanding architectural features. In the present century, however, enlightened administration has greatly improved the town as a residential area. The principal public buildings and institutions, other than churches, are the Town Hall (1844), the Custom House, the Public Library, the Tyne Sailors' Home, the Master Mariners' Asylum, the Municipal High School, and the Tynemouth Victoria Jubilee Infirmary. For its size, North Shields is rich in parks and playing-fields. Chief among the former, the Northumberland Park (17 acres) embraces and preserves part of what was formerly known as Spital Dene. From the Northumberland Dock (opened 1857) and the Albert Edward Dock (1884), built by the Tyne Improvement Commission, large quantities of coal and coke are normally shipped. The imports are general, timber predominating. At Whitehill Point the most modern appliances exist for loading cargoes of coal or bunker coal to ships in the river. Vessels of any size can be dealt with at any state of the tide with the utmost despatch. Apart from shipping, the chief industries are shipbuilding and repairing, general marine engineering, coal-mining, and fishing. The port of North Shields as a fishing centre is the most important in point of landings and value of trade between Aberdeen and Hull. This town is the birthplace of the painters George Balmer (1805–46) and Birket Foster (1825–99), also of William Wouldhave (1751–1821), who shares with Greathead the honour of inventing the Lifeboat (q.v.). Henry Taylor (1737–1823), who originated the system of lightships in such places as Goodwin Sands, was from 1772 to his death associated with North Shields.

Tynemouth, from which township the borough takes its name, is an exceedingly picturesque seaside place; clean, bright, and healthy. The main stretch of sand is about a mile long, and there is a large thoroughly modern bathing-pool. The imposing-looking Plaza, surmounting the sea-banks overlooking the sands, has become a well-known landmark on the coast. Built in 1877–78, it was originally an aquarium, and is now used for promenade concerts, &c. The stone pier, nearly a mile long, is one of the protecting arms sheltering the entrance to the Tyne. The large monument to Lord Collingwood, by Lough, overlooking the harbour, was erected in 1845. The Tynemouth Volunteer Life Brigade, formed on the 5th December 1869, was the first official organisation of its kind in the kingdom. A wide drive, known as the Grand Parade, extends from Tynemouth to Cullercoats.

Cullercoats, with its quaint little harbour, was centuries ago a busy coal-loading port. It is an old fishing centre, and there is still a fishing community there which faithfully preserves many ancient customs and traditions. The place is now almost entirely a residental area. East Howdon is almost solely given to shipbuilding; Chirton and Preston to coal-mining, though large building estates have been developed since 1920 in connection with the corporation housing schemes; and Percy Main is an important railway junction for dock and river mineral traffic. The borough also embraces a comparatively large agricultural area. The population of the borough in 1881 was 44,118; in 1891, 46,588; 1911, 58,816; and 1921, 63,786. It sends one member to parliament.

Tynwald. See MAN (ISLE OF).

Type, in Chemistry, a chemical compound which represents the composition and structure of many more complex compounds; especially Gerhardt's four types—hydrochloric acid (HCl), water (H_2O), ammonia (NH_3), and marsh-gas (CH_4).

Type, in Theology, specially the foreshadowing in the Old Testament of something realised in the New (the *antitype*). Thus in the New Testament the brazen serpent is a type of Christ (John, iii. 14), and so is the paschal lamb (1 Cor. v. 7). The seeking and finding of types was carried to an arbitrary extreme in the allegorical interpretation (see EXEGESIS, ORIGEN). See Fairbairn, *Typology of Scripture* (1845–47; 6th ed. New York, 1880).

Types (Gr. *typos*, Lat. *typus*=an 'impression' or 'stamp') are usually cast in lead, with a small proportion each of antimony and tin to give hardness and toughness respectively; sometimes a trace of copper is added. These proportions vary according to the size of type to be cast, and, again, each foundry has its own particular formula, which differs slightly from that of others, but lead forms the bulk—roughly, two-thirds of the whole. That used for mechanical composition or for stereotyping is of a lower standard than that used for ordinary hand-set type—that is, it has more of lead and less of the other constituents. The height of a single type is about $\frac{1}{4}\frac{2}{8}$ths of a shilling standing on edge, or, to be more precise, 0·918 of an inch. This is as far as English type is concerned, that of other countries varying somewhat.

The former denominations of type-bodies, such as Pica, Long Primer, Brevier, and Nonpareil, are generally being discarded, and they are now usually expressed in points; but these bodies still bear some relation to the old standards, which are described later on. For instance, Pica body measured six lines to the inch, and the point system adopted by this country is based on twelve points to Pica, which gives 72 points to the inch. Larger types than 72 points, such as are used for broadsides or posters, are usually cut on wood, the necessary enlargement being made by the pantographic method, which permits of the design of any selected type-face being closely followed.

The very small sizes of types (3 points being the smallest) are graduated by half-points, the middle sizes by one point, and the larger by two or even more points. Under this system each body has a definite relation to another, which renders the justification or alignment of various bodies a simple matter.

The old method of type-founding was to cast each letter singly and in a hand-mould, which was a slow and tedious process. This is rarely used nowadays, except for the casting of any special or extraneous letters or signs. For hand-set type, machines of various designs are now generally employed, and these will cast thousands of letters per hour as compared with hundreds turned out by the hand-moulds. Moreover, machine-cast types need little and, in some instances, no after-dressing. It will be of interest to the general reader to give a short description of the old hand-mould method which was in use up to the middle of last century.

The first step was to cut a punch, which required great dexterity. A piece of steel was taken, two or three inches in length, and sufficiently thick to carry the face of the letter to be engraved thereon. This bar of steel was first annealed, and, as the cutting proceeded, smoke-proofs were taken to show progress. When finished the punch was hardened, and this was struck into a short thick bar of copper which formed the matrix (sometimes called a 'strike'). This matrix required very careful justifying to insure perfect ranging and depth of face in casting. The master-punch was preserved, and could be used for producing fresh 'strikes' as often as necessary. The mould employed consisted of two equal portions, made of wood and lined with iron, which, when brought together, were fastened with a spring-loop, which also held the matrix in its proper position to receive the molten metal when poured in at the mouth of the mould. Each size of type required a separate mould, and the width of the particular letter to be cast could be regulated by certain screws inside the mould. When the mould was closed with the matrix in position, the operator held this in his left hand and dipped his small ladle into the metal-pot. He then poured just sufficient into the mould, and, with an acquired jerk of the hand holding the mould, sent the molten metal right home into the interstices of the matrix. The cast immediately cooled, the mould was released, and the letter liberated. The surplus metal at the foot—the tag—had then to be broken off before the letters were dressed and examined to see if perfect. This having been done, each separate letter was set up in convenient pages and packed for delivery. It has been said that 200 letters could be cast in the hour by this process, but the quantity varied according to the size of type produced. Moxon, the first English writer on type-founding and printing, in his *Mechanick Exercises* of 1683, mentions 4000 letters as a day's work; but even if the operators worked twelve hours, exclusive of meal-times, we feel that was too high an estimate, for it would mean over 300 castings per hour. Each type was cast with a nick or nicks on the front side. These allowed the compositor in picking up each letter from his case to arrange the types in the proper way in conveying them to his composing-stick. Another use of these nicks was to make discrimination easy between the different founts that happened to be cast on the same depth of body. Some foreign types are made with the nicks on the back and not the front side.

The ordinary type-casting machine for hand-set type consists of a furnace, metal-pot, and casting apparatus actuated by a crank worked by hand—sometimes power is applied. At each revolution of the crank a piston or plunger, suspended over the metal-pot, injects sufficient metal to fill the mould and the matrix which is held in position by a lever. Directly the mould is filled with metal the lever holding the matrix is released, and likewise the type. The mould then closes automatically, and a fresh supply of metal is pumped in, the process being repeated for each cast, it is said, at the rate of 3000 or more per hour, and still more if driven by power. The machine mostly used in this country is similar to that invented by David Bruce of New York in the middle of last century, but has been subject to many improvements at different times, and the pivotal principle has now been generally adopted for both hand and motive power. The frame rocks at each revolution with the turn of the crank, which separates the mould from the nozzle of the pump, and allows of the mould opening and liberating the letter, and then closing for the next casting.

Another power-driven casting-machine is that on the rotary principle, which very considerably increases the rate of production and delivers finished types that need no dressing.

Except for special letters, or any odd signs, punches are now produced by machinery of a very complex character and adjusted with mathematical precision. The various sizes of any one series are reproduced by the pantographic method, which was first employed for the cutting of large type-faces on wood, and has been already referred to. This is due to the fact that type-setting machines demanded a much quicker and more economical method of producing punches, which is also applied generally for hand-set types because of the difficulty of finding sufficient men to cut punches by hand. To engrave punches by simply enlarging or reducing is perhaps not an ideal method, because the proportions of the ascending and descending letters, such as b, d, h, and p, q, y, should strictly be varied according to the precise size of face to be made. This was formerly considered an insuperable difficulty, but it has been to some extent modified by the careful judgment of the operator in using his mechanical apparatus. Machine-made punches for ordinary hand-set type are made in much the same shape and style as when made by hand and in steel, as likewise those for the different composing-machines. But as regards matrices, those made for casting hand-set types are usually of copper as before. Those employed for mechanical type-setting machines on the slug system vary; an alloy, chiefly of nickel, and sometimes with a copper base, is much favoured. Again, these matrices are of various shapes and sizes, and also specially keyed to facilitate the return to their respective magazines, to suit the particular machine in use.

A complete fount of type consists of about 152 Roman characters, including figures, punctuation marks, accents, reference marks, &c.; and usually of 88 Italic characters only, because small capitals are not usually supplied with this kind of face, nor figures, as the Roman figures are generally employed.

These numbers given are exclusive of the different kinds of spaces of varying thickness for placing between words, and of the quadrats for filling out short lines. Certain letters in both series are ligatured or tied together, such as fi, ff, fl, because the overhanging kern of the f would 'kiss' or break if it were followed by another tall letter, such as i, f, l. This accident would not occur if such short letters as a, e, o, u followed f.

The following table gives, on the new system of points now generally employed in this country, the equivalent and approximate sizes of the principal and more important type-bodies.

Brilliant	3½ points.	Small Pica	11 points.
Diamond	4½ "	Pica	12 "
Pearl	5 "	English	14 "
Nonpareil	6 "	Great Primer	18 "
Minion	7 "	Paragon	20 "
Brevier	8 "	Double Pica	22 "
Bourgeois	9 "	2-line Pica	24 "
Long Primer	10 "	3- to 6-line Pica	36–72 "

There are one smaller and a few intermediate sizes other than those given above. Larger founts, we repeat, are usually cut on wood.

The more usual sizes of types employed in this country are reproduced below in the modernised old style face, with their sizes in points:

Points.

18. Chambers's Encyclopædia.

14. Chambers's Encyclopædia.

12. Chambers's Encyclopædia.

11. Chambers's Encyclopædia.

10. Chambers's Encyclopædia.

9. Chambers's Encyclopædia.

8. Chambers's Encyclopædia.

7. Chambers's Encyclopædia.

6. Chambers's Encyclopædia.

5. Chambers's Encyclopædia.

4. Chambers's Encyclopædia.

The black squares at the ends of lines indicate the precise depth of the body on which the various sizes are cast, allowing for all ascending and descending letters, such as b, d, h, and p, q, y, the letter j covering the whole depth of the body.

The earliest types were limited in form and naturally resembled the characters in prevalent use for book-writing prior to the introduction of printing. The first to be used was a pointed black-letter called *lettre de forme*, which was generally employed for church service books, but the laity preferred a more simple form of Gothic which was rounder and less pointed in design. This was known as the *lettre de somme*. Neither of these met with general approval in Germany, and by the end of the 15th century another form, termed *Fractur*, was adopted, which was still a black-letter, but more cursive in character and quite distinct from the two first types just mentioned. A variation of Fractur was also designed and called *Schwabacher*, which was rounder and less involved in form. It is these two characters that have since prevailed in Germany; but during the present century especially there has been a growing demand for printing in Roman types, and this has displaced some proportion of that formerly done in black-letter. Yet another form of Gothic letter, favoured by the early French printers, was the *lettre batarde*, which was apparently a combination of other forms of black-letter, pointed and compressed. Outside Germany it may be assumed that these several Gothic forms of lettering are now rarely used except for special works or an occasional line here and there.

The type used by Gutenberg of Mainz for printing the 42-line Bible (*c.* 1455) called after him (and sometimes the Mazarin Bible) was that of the pointed black-letter, but later on he employed a rounder form of Gothic character. That used by Fust and Schoeffer was also the pointed black-letter, as shown in the Latin Psalter of 1457, but the type used here was larger. It is interesting to note that this book contained initial letters in colours, and another point is that this Psalter was the first book to bear the date and names of the printers. Their 36-line Bible of 1461 was printed in the same character but slightly larger than that used for the Gutenberg 42-line Bible. A little later the Fractur or Schwabacher designs, with trifling variations already referred to, were generally adopted throughout Germany until recent times, when the demand for Roman type set in.

Before Roman characters were employed in printing there was a transitional period which commenced towards the end of the 15th century, and one of the best examples of that kind is to be found in the joint work of Conrad Sweynheym and Arnold Pannartz of Subiaco, in Italy. Both were Germans, and probably at the sacking of Mainz in 1462 they found their way to Italy. Here, in their examples, may be readily traced the evolution of the Roman from the black-letter characters. It was the work of these two men which inspired Mr C. H. St John Hornby of the Ashendene Press, London, to design his special fount of type which he has employed with so much success for the printing of many fine books since 1902. He is now employing a new design modelled on another 15th-century type.

All authorities, both ancient and modern, have given credit to Nicolas Jenson of Venice for what may be considered the most perfect form of Roman lettering, and his *Eusebius* of 1470 is a splendid example of that character. Jenson was really a Frenchman, and it is a tradition that he was sent to Mainz to acquire the art of printing, but went to Italy in 1468 instead of returning to France, as was intended. It is known that William Morris in starting his Kelmscott Press in 1891 modelled his 'Golden' type largely on that of Jenson. Again, the late T. J. Cobden-Sanderson and Mr Emery Walker were also greatly influenced by the same printer in designing the type of the Doves Press, founded in 1900. In addition, some of the new founts designed during the present century, here and in America too, have been based on the work of this celebrated Venetian printer. Curiously, although Jenson was famous for his Roman letter, he was compelled still to print in black-letter, in order to satisfy the demands of a certain section of book-buyers.

Another famous printer of the 15th century was Erhard Ratdolt of Venice, who came from Augsburg. He commenced to print in 1476, and in 1486 he issued his well-known specimen sheet of printing types which he designed and used in his printing house. These included Gothic, Roman, and Greek. He is said to have been the first to print direct specially designed initial letters in colour, and not painted in by hand after printing, as had been the custom.

Aldus Manutius (the first) was another printer of Venice, and of some note. His finest work with Roman type, the *Hypnerotomachia Poliphili* of 1499, contained many excellent line illustrations which, with some decorative initial letters and chapter headings nicely set out, combined to give a harmonised effect to the whole. It was Aldus that first adopted the Dolphin and Anchor as his

press-mark, and he was the first to design and use Italic type, which was said to be a copy of contemporary handwriting. His *Juvenal and Persius* of 1501 shows the ordinary Roman capitals used in conjunction with the Italic lower case letters, these capitals standing clear from the other letters of the word, thus: *Aldus*. Aldus is sometimes considered as a pioneer in the production of small and handy books, which he published at a low price. Many of these were the Latin and Greek classics. See ALDINE EDITIONS.

The use of Italic induced Robert Granjon of Paris, printer and publisher, to introduce a new form of cursive character which was more or less a copy of Gothic handscript. But it was not very readable, and certainly not very clear in the mass. This was first used at Lyons in 1557, and called *Civilité*.

The early French printers appear to have favoured types of the Roman form of the transitional character, but occasionally they employed black-letter, more particularly that termed *lettre batarde*. The examples of the incunabula period exhibit both classes, but later on a much greater variety is to be observed. This included Roman, Italic, and black-letter of different characters, and also decorations, many of which were designed by celebrated artists, some of whom were also printers. Among these, spread over a long period, are Antoine Verard, M. Frieburger, Simon Vostre, Phillipe Grandjean, Robert Granjon, Louis Luce, Claude Garamond, Geoffrey Tory, the Estiennes, Jean Grolier, the Fourniers, and the Didots. It was during the 17th century that the national printing office was founded, it was said, by Richelieu and Louis XIII. This still survives, under the title of the Imprimerie Nationale de France. Originally it was the Imprimerie Royale, and for a period the Imprimerie Impériale, according to the existing régime.

That Holland claims to have invented printing is well known, for a great deal of controversy has raged in modern times as to the merits of some very rough specimens of printing which are said to be the work of Laurens Janszoon Coster (or Koster), who preceded Gutenberg by some thirty years. The work of Gutenberg was of a much superior character, and most bibliographers have credited him, and still do so, with being the real inventor of printing from movable types. The few examples attributed to Coster are certainly printed in a very crude kind of black-letter of the *lettre de forme* character of indifferent design and manufacture, and the printing was also very poor. Towards the end of the 15th century printing in the Netherlands began to improve, both in design and execution; and later on, during the 16th century, still greater improvement was evident in both types and printing. One of the earliest and most eminent printers in the Netherlands was Christopher Plantin (?1514–89), a Frenchman, and originally a bookbinder, but who took up printing through an accident which prevented him from working at his original craft. The first book he printed at Antwerp is dated 1555, and his work there covered a period of some forty years. It is said that he printed some fifteen hundred different works in all. He employed many artists to design various type-faces, and cast many himself. Others he acquired from the many type-foundries then in Holland and the Low Countries, and also from France, where he was born and received his training. His most important work is considered to be that of the Polyglot Bible, which was printed in five different languages, and was commenced in 1567. A visit to the Plantin-Moretus Museum at Antwerp, now a public museum, and containing much of Plantin's work and plant, affords an interesting study.

Another famous Netherlands printing firm was that of the Elzevirs, which family flourished during the 17th century. They were the printers and publishers of many dainty editions of the classics, nicely printed, and issued at popular prices.

We have mentioned the fact that there were many type-foundries in the Netherlands — one, that of Messrs Enschedé of Haarlem, is still extant, and that firm has in course of time absorbed many of the smaller type-foundries that existed during and after Plantin's time. Prior to William Caslon cutting his celebrated series of 'old face' types early in the 18th century, the bulk of printing types used in England were obtained from the Netherlands. These included the celebrated Fell types, still in the possession of the Oxford University Press, which were collected by Dr Fell (1625–86), some time Bishop of Oxford, during the 17th century. These old types had lain idle for a long period, but were revived about 1874, when the late Dr Daniel persuaded the Oxford University Press to let him have the use of a few types for his private press. Since that date the University Press has occasionally employed them for special work.

When William Caxton (1422–91) brought the art of printing to England in 1476, he carried with him certain types obviously of Flemish character and similar to the *lettre batarde*. He is said to have used eight different founts in all, and that first used in England was his No. 2 series. This was for his *Dictes and Sayings of the Philosophers*, issued from Westminster in 1477. No. 1 fount was used at Bruges for the first books he printed there in English in 1474–75, namely, *The Recuyell of the Historyes of Troye*, and *The Game and Playe of the Chesse*. His assistant, Wynkyn de Worde of Alsace, who succeeded him, at first employed several of Caxton's founts, but he afterwards adopted a purer form of Gothic letter, similar to the *lettre de forme*. Richard Pynson, also a Frenchman, who followed, used various founts similar to those of Caxton and de Worde, and, later on, some of Roman character. This was early in the 16th century.

A few other names may be mentioned of a later period of outstanding merit in the designing of types, and these are: John Day (1522–84), Joseph Moxon (1627–1700?), William Caslon (1692–1766), and John Baskerville (1706–75). Both Day and Baskerville were printers of eminence, and Caslon was celebrated for the cutting of many founts of various designs, which included the admirable series of 'old face' types which displaced, during the 18th century, the types largely imported from the Low Countries, of which the Fell types, already mentioned, are good representatives. Caslon's 'old face' series was extensively used during the second half of the 18th century, when the fashion changed and various so-called 'modern faces' came into vogue. These were based, it is assumed, on some of the founts designed and used by Giambattista Bodoni of Parma (1740–1813), and also on some designs employed by certain French printers. After lying dormant for some years, the 'old face' series was revived in 1844 by Charles Whittingham of the Chiswick Press, and since that date is still much in demand. As a result of this revival Messrs Miller & Richard of Edinburgh designed and cut a series of what may be described as 'modernised old style,' of similar character but lighter in face—that was about 1857. This induced other founders in later years to introduce other variations of this same class. Up to the commencement of the present century Caslon's types were used chiefly for works of a more antique character, whilst the various forms of the more modernised old style were adopted for the bulk of book-printing. 'Modern face' was largely

employed for newspaper work and formerly for all government work. But here again fashion is changing and there is a growing appreciation of the older forms of type faces.

Many new faces have been designed mostly during the present century, so that the choice is far less limited than it was years ago. The selection needs much care, for it is considered better taste to use one series only for any one work than to employ two or three or more designs. The selections should be limited as regards variety, but care should be taken to acquire sufficient sizes of the same series for working purposes.

Prior to William Morris establishing his Kelmscott Press in 1891, book-printing founts were limited to, roughly, three classes of design, but each division was subject to trifling variations in design, and especially those of the third category. The three classes are as follows:

1 Old Face
2 Modernised Old Style
3 Modern Face

As already explained, the first example is that of the original Caslon, the second the modernised old style of Messrs Miller & Richard, and the third is a specimen of modern face (unnamed), which was responsible for the decline of the Caslon original old face series a century or more ago.

With the advent of the present century, and the remarkable developments of the various forms of type-setting machines (see article PRINTING, Vol. VIII. p. 387) a demand has been created for newer and better designs in type-faces, especially for book-printing. This has resulted in many of the best designs being absorbed for mechanical type-setting. Most of these new founts have been adapted, or at least modelled on those employed by the most famous printers of early times, as some of the names will indicate. Some are the exclusive property of the ordinary type-founders and others are owned by various machine type-setting manufacturers, whilst a few designs are employed for both hand and machine composition. Here are a few examples of plain book founts on 12-point bodies:

This is the PLANTIN type-face
This is the FLEMISH type-face
This is the IMPRINT type-face
This is the CHELTENHAM type-face
This is the KENNERLEY type-face
This is BASKERVILLE type-face
This is the GARAMOND type-face
This is the ITALIAN Old Style type-face
This is the BODONI type-face
This is VERONA type-face
This is the GOUDY OLD STYLE type-face
This is the POLIPHILUS type-face

As regards legibility, the smaller types are to be avoided as far as possible. The particular design of a fount is, however, an important point to be considered, because a well-designed type-face is generally more legible than one that has not been well considered in the first instance. A few years ago the British Association for the Advancement of Science appointed a committee to report on the influence of school books on eyesight, and that report included some very interesting conclusions on the character of type-faces employed for educational purposes, and recommended that types should be clean cut and well defined. Condensed or compressed type should not be used, nor the contrast between thick and thin lines too great. The committee could not discriminate between the 'modern face' and that of the 'old style' character, which should be left to individual judgment, provided the foregoing details are observed. Long lines they held to be objectionable for continuous reading, and, on the other hand, they considered very short lines involved too frequent a change of direction in the movement of the eyes.

BIBLIOGRAPHY.—The reader is referred to these works dealing with various types: William Blades, *The Life and Typography of William Caxton* (2 vols., 1861–63), and various other works by the same author; T. L. De Vinne, *Historic Printing Types* (1886), and *Plain Printing Types* (1900); T. B. Reed, *History of the Old English Letter-Foundries* (1887); Stanley Morison, *On Type Faces* (1923); also many of the works contained in the bibliography of the article under PRINTING, in Vol. VIII. p. 392, of this Encyclopædia, may be consulted.

Type-setting Machines. See PRINTING.

Type-writer, a machine for producing legible characters on paper by mechanical means without the use of a pen. The Remington (1873) was invented in 1866–68 by C. L. Sholes of Milwaukee. Each letter is produced separately, either by a series of distinct arrangements of the machine as a whole at the will of the operator, or else by actuating a separate device for each letter, each such device being set at work by means of a key on a keyboard. The construction may, or may not, be simplified by contriving that one key shall be available for more than one letter. On this basis type-writers may be divided into two-hand machines and keyboard machines. In the former the operator moves an index with one hand until it coincides with the desired letter or character on an indicator, and then with the other hand he presses a mechanism which brings the paper into contact with an inked type corresponding to the character required. The mechanism then automatically carries the paper along through the breadth of one letter, and the process can be repeated for the next and succeeding letters. In keyboard instruments each key is marked so as to indicate the character or characters which can be printed by means of it; and as the keyboard is so arranged that those letters which are most frequently in use are nearest to one another, the operator has to 'learn the keyboard,' so that he may be able to strike the appropriate keys without looking for them, before he can acquire high speed of manipulation. In some instruments — Remington, English, Hammond — there are fewer keys than there are characters producible; in that case the operator must move a key or knob with the hand which is the less occupied at the moment when one of the less usual characters (such as a capital letter or a figure) is required: and this action shifts the interior mechanism. In others—Caligraph, Yost, Smith Premier—there is a separate key for every character producible. The opinion of operators seems to be divided as to which of these methods is the more convenient in practice. A keyboard instrument of

the last-mentioned class can, so far as the key-board is concerned, be worked with one finger of one hand; but a rapid operator uses both hands, and generally uses his fingers like a piano-player. Different instruments differ in their touch: some, like the Hammond, require a *legato* rather than a *staccato* touch; others require smarter raps on the keys. In some cases the force with which the type is made to produce an impression on the paper depends on the force of the original stroke; in some the pressing of the key liberates mechanism which acts independently of the finger stroke. The former is advantageous when it is desired to change suddenly from ordinary type-writing to manifolding: the latter is conducive to uniformity of impression, and in most cases machines of this type can have the force of the impact between the type and the paper adjusted by varying the tension of a spring. When the key is pressed down what happens inside the machine depends upon the way in which the types are arranged; in one class of machines ('type-bar' machines) they are fixed at the end of bars arranged in a circle or an arc of a circle, and so pivoted that they will all strike at a common printing point—e.g. Remington, Caligraph, Yost, Smith Premier; in others they are engraved on a type-wheel which is brought round into the proper position by the appropriate key, and the paper pressed against it (Hammond). The advantage of the latter class of machine is that the type-wheel can be changed, and thus small type for foot-notes, italics, small capitals, and other typographical devices can be readily employed, whereas with the type-bar machines such a change can only be effected by extracting each individual type and substituting another for it.

Among type-bar machines some — Remington, Caligraph, Yost, Smith Premier—have the type striking upwards from below, so that the writing is not in sight until the top of the machine (the paper-carriage) is lifted, or, as in the Smith Premier, pulled forward: others have the type-bars starting backwards from a semicircle or the arc of a circle and striking from above or from the front so that the writing is always in sight—Bar-lock, English, and Maskelyne. One very important requisite in this type of machine is that all the letters should come to precisely the same printing point. In the earlier type-writers this desideratum was imperfectly secured: the bearings on which the bar was pivoted were narrow, and the bar itself long: consequently when the joint worked loose, or the bar became a little bent, the work produced was bad in alignment, or straightness of line. In order to obviate this the type must be guided to the exact spot, as in the Bar-lock, where the type-bar falls into a groove, and is there locked in its proper position before the impression is taken, or in the Yost, where the type strikes through a bevelled aperture in a centre guide; or else the construction must be such as not to allow any deviation, as in the Smith Premier, in which the problem has been most ingeniously solved of using very short type-bars with very wide bearings. In type-wheel machines the alignment depends on the accuracy of rotation of the type-wheel into position without axial shift, or with just the proper amount of axial shift, as the case may be. Another desideratum which it seems impossible to attain at present is to avoid the unpleasant effect which is caused to the eye, accustomed to typography, through the apparently abnormal distribution of the letters in a word. In printing, the type 'm' is wider than the type 'i;' in type-writing 'm' and 'i' must occupy an equal space. The objection to this has been largely overcome by the mode of cutting the type-writer fount of types, but by no means wholly so.

The mode in which the type is made to mark the paper differs in different machines. In most cases the type marks the paper through an intervening ribbon saturated with an appropriate ink, which ribbon is automatically made to travel a little at each impression, being wound off one spool on to another, and thus not presenting precisely the same point twice in succession to be squeezed between the type and the paper. In most cases the ribbon is simply unwound; in the Smith Premier the whole breadth of the ribbon comes into use once in each line of printing. In the Yost machine there is no ribbon: the type rests normally against a pad saturated with ink, and the type prints directly on the paper just as in ordinary typography. Different machines present, in addition to the above leading features, greater or less ingenuity in devices designed for practical convenience, as well as for durability and easy repair and maintenance in good condition. One thing of importance in studying any particular machine is to observe what happens when two contiguous keys are sharply depressed at the same time, as may occur by accident in rapid working, if the keys are too close together. Some machines will take paper of any width, others only paper of limited width; some are better provided than others with means for taking up wear of the apparatus; some are more nearly noiseless than others; some have simpler arrangements than others for bringing a given part of the paper to the right place for printing or for correction; some have more convenient arrangements for maintaining margins at any desired breadth; some have more convenient devices for cleaning the types, as by means of a circular brush screwed up from the base of the machine; some lock the mechanism at the end of a line, so that printing comes to an end until the paper-carrier is run back to a new line; in some a smaller depression of the keys is necessary than in others; in some the number of wearing points is brought to a minimum; in some the various parts of the machine are more accessible than in others for cleaning, dusting, and oiling; in some a change is more conveniently made than in others, whereby a hard 'platen' may be substituted for a softer one. The platen is a cylinder against which the type presses the paper: if this be too hard it tends to wear the type and cut the paper; but if it be desired to make copies on carbon paper the carbon paper is placed behind the printing paper with thin paper between; and this alternation of thin paper and carbon paper may be repeated up to an appreciable thickness; then by firm strokes against a *hard* platen a number of copies may be made. A type-written document may also, if a copying ribbon (one saturated with appropriate copying-ink) be employed, be copied in the copying-press; and if lithographic ink has been employed the print may be transferred to stone. By means of Edison's Mimeograph the type-writer may also be utilised for making numerous copies in printer's ink; but the presence of a ribbon tends to interfere with its efficiency in this respect.

Typha, a genus of monocotyledons, temperate and tropical marsh plants, forming a small family Typhaceæ. *Typha latifolia* is one of two distinct reed-like plants to which the name of Bulrush (q.v.) is given. *T. angustifolia*, another British species, is very similar.

Typhoid Fever. The name, though firmly rooted in popular and even in scientific usage, is an unfortunate one, as it tends to perpetuate the confusion which long existed between this disease and typhus fever. It is best called *enteric* (i.e. intestinal) *fever*. There is really a group of closely

allied fevers, enteric, paratyphoid A, paratyphoid B, &c., due to similar organisms, so that cases are often said to belong to the 'enteric group.' Enteric fever was long confounded with typhus; though it can now be traced in the records of disease with much probability as far back as the 16th century. Early in the 19th century the connection of severe fevers with intestinal lesions was recognised in France; but the credit of finally proving the non-identity of typhus and enteric fever was due to Drs Perry, Stewart, and Gerhard about 1836–37.

Symptoms and Course.—Enteric fever chiefly affects children and young adults; it is rarely met with after middle life. The period of incubation (see MEASLES) is generally from ten to fourteen days, but may in rare cases be as short as two days, or as long as three weeks. The onset is generally gradual, the patient complaining of weariness, headache, sickness, or diarrhœa for some days before he is compelled to take to bed. It may, however, be quite sudden. All the usual symptoms of the feverish state succeed; the temperature generally reaches 103°, sometimes 105° or 106°, but is one or two degrees lower in the morning than at night. The pulse, except in severe cases, is less quickened than in most febrile diseases; frequently it does not exceed 90 or 100 per minute throughout. The tongue is generally coated on the dorsum, but red at the tip and edges. The digestive organs are much disturbed; sickness and vomiting are frequent at the beginning of the attack; there is almost always some discomfort and tenderness in the abdomen; and diarrhœa, though not a constant, is a very characteristic symptom. Generally during the second week the characteristic rash appears, consisting of small rose-coloured spots coming out in successive crops, so that, though each spot lasts only three or four days, some can be discovered for ten days or more. The rash is rarely copious, and sometimes altogether absent, but it bears no proportion to the severity of the case. The pupils are generally somewhat larger than normal. Some cough is very frequently present. Delirium may be absent throughout, but when present is apt to be very severe and troublesome. The feverish state usually lasts about three weeks, by the end of which time the patient is very thin and weak. Its subsidence in the great majority of cases is very gradual, and convalescence is slow, while relapses are not infrequent. Death may take place by coma, by exhaustion, in consequence of severe hemorrhage from the bowels or of perforation of their coats, or from pneumonia or some other complication; rarely from any cause before the second week.

The death-rate in hospital cases has varied from 5 to 20 per cent.; usually it is about 7 or 8 per cent. It is least below the age of twenty, and increases, though not very markedly, with age. Slight and abortive cases are by no means uncommon.

Post-mortem Appearances.—The one characteristic lesion associated with enteric fever has its seat in Peyer's patches and the solitary glands of the intestine (see DIGESTION), particularly at the lower part of the small intestine. They first become congested and swollen, then grayish; the swollen tissue dies and is cast off, leaving an ulcer corresponding in shape to the affected patch. These lesions explain the diarrhœa and abdominal pain, and the liability to intestinal hemorrhage and perforation which are so characteristic of the disease. The spleen also is enlarged, and this forms an important point in diagnosis.

Treatment.—In no disease is careful nursing of more vital importance. The patient must be kept in bed, and saved from fatigue as far as possible. The diet must be regulated with special care, not only during the continuance of the fever, but after convalescence has set in. Milk should be the chief food, artificially digested if necessary, and supplemented with beef-tea, chicken-tea, or other animal soups. No solid food should be given, except perhaps a little dry toast if the patient can take it; solid fragments of food, such as grape-stones, or even particles of the pulp of fruits, may so irritate the ulcers as to lead to hemorrhage or perforation. Stimulants are usually necessary in severe cases. No drug is known to cut short the disease; and in many cases none is required. High temperature may often be brought down with benefit, either by cold sponging, the cold pack, or immersion in a tepid bath. Diarrhœa should be checked by opium or astringents.

Causation.—Enteric fever is one of the most ubiquitous of diseases, being probably present in all parts of the world; but it is less frequent in tropical countries. It is now proved to depend on defective hygienic conditions, and particularly on imperfect disposal of excreta. The bacilli are discharged in the patient's dejecta. It is rare, if proper care is taken, for nurses or others attending on cases of the disease to become infected; and infection is usually contracted from drinking-water and milk which have accidentally become contaminated with the bacilli. In the great majority of instances the disease can be traced to infection from a previous case; occasionally persons who have had the disease and have recovered remain 'carriers' of the bacilli, so that their dejecta remain a source of danger to those about them. It has long been recognised that the infective agent must be an organism, and in 1880 Eberth described a form of bacillus as the real cause of the disease; and this can be grown from the blood in early stages of the fever. Subsequently cases presenting a similar but milder set of symptoms have been found to be due to closely allied bacilli known as *Bacillus paratyphosus A*, *Bacillus paratyphosus B*, &c. Such cases are said to belong to the enteric group. But, while the question as to the relations of the several bacilli remained open, preventive inoculation with a culture of Eberth's bacillus, first tried in 1896, was largely in use during the South African campaign, with varying but frequently successful effect. A further demonstration of the protective value derived from a mixed vaccine of the typhoid and paratyphoid A and B organisms was given by the result of the universal inoculation in the British army during the World War.

See Murchison's *Continued Fevers*; Hirsch's *Geographical and Historical Pathology*; Ker's *Manual of Infectious Diseases*.

Typhon, the Greek name of a son of Seb and Nut (Rhea). See EGYPT, OSIRIS.

Typhoons. See STORMS.

Typhus Fever (Gr. *typhos*, 'mist,' 'stupor') has probably had an important place among the pestilences attending upon war and famine in all ages; it can be traced back with some definiteness to the 11th century, and from the 16th at least has been a frequent epidemic. It is generally regarded as the pestilence of the 'Black Assize' (q.v.), and has been known as *jail fever* or *camp fever* at various times.

Symptoms and Course.—Typhus occurs at all ages, but most frequently between ten and thirty. The period of incubation (see MEASLES) is most commonly about twelve days, but may be as long as three weeks, or may be absent, the symptoms beginning immediately after infection. The onset is generally definite, sometimes quite sudden; severe headache, with pains in the back and limbs, shivering, prostration, and loss of appetite are generally the early symptoms. The prostration

rapidly increases; the face is flushed and dusky, and the expression dull; the temperature generally rises to 104° or 105°, without much remission, and the pulse to 100 or 120 per minute. The tongue is at first white, but generally, except in very mild cases, becomes dry and brown. Vomiting and diarrhœa are only exceptionally present. Generally about the fourth or fifth day the characteristic rash, called by Sir W. Jenner the *mulberry rash*, appears, and after two days or so no fresh spots come out. The rash consists of rounded or irregular spots, which may be at first bright red, but may be from the beginning, or if not, soon become, livid or dusky, owing to minute hemorrhages (Petechiæ, q.v.) into the skin, of which they are the seat. The rash is rarely absent, except in children; and its copiousness and lividity are generally in direct proportion to the severity of the case; when very dark, it constitutes the so-called *black typhus*. It generally remains visible till the crisis. About the end of the first week the headache gives place to delirium, generally of a quiet type; and during the second week this often passes into partial or complete unconsciousness. The pupils are generally much contracted. Towards the end of the second week the patient becomes more and more feeble and prostrate; tremors of the muscles, with jerkings of the limbs, or picking at the bedclothes are almost always present. But about the fourteenth day, if the patient live so long, a rapid change takes place called the *crisis*. Within from twelve to thirty-six hours the temperature falls to normal or lower; the pulse is slowed in proportion, intelligence returns, and the patient feels no discomfort but weakness. In a few days the appetite becomes ravenous, and convalescence is rapid and uninterrupted. Relapses are almost unknown, but broncho-pneumonia is a frequent complication, and may carry off the patient as the original fever is subsiding. In fatal cases death usually takes place in the second week, either by coma, by failure of the heart, or by broncho-pneumonia. The death-rate in hospital cases is usually from 15 to 25 per cent.; but under unfavourable circumstances—e.g. in wars or sieges—it has sometimes been 50 per cent. or even higher. In children typhus is hardly ever fatal; its danger increases in a very marked degree with the age of the patient.

Post-mortem Appearances.—If the patient die while the rash is present, it remains visible after death. The internal organs present no distinctive changes, as the fluidity of the blood and softening of tissues present are also met with in other rapidly fatal febrile diseases.

Treatment.—No means is known of cutting short the disease. Good nursing, a plentiful supply of fresh air, administration of abundant liquid nourishment, and in many cases free stimulation, are required. Sleeplessness is often a serious symptom, and requires to be met by opiates. When the climate is suitable, treatment under tents in the open air is most satisfactory.

Causation.—Typhus is a disease specially associated with filth and overcrowding. It is generally met with, therefore, in the squalid parts of large towns. Epidemics are very frequently associated with want and privation, as in war and famine. It is extremely contagious, and the infection appears to be spread, largely at least, by lice. In the great majority of cases it can be traced to infection from a previous case; instances to the contrary are so few that its origin *de novo*, strongly maintained by Murchison, must be regarded as extremely improbable. No characteristic organism has been discovered. The infection can be conveyed by clothes, &c., but much less readily than some other infectious diseases—e.g. scarlet fever and smallpox. It is rare for a person not himself infected to convey the disease to one who has not been in contact with the sick.

It is a disease for the most part of temperate climates. At the present day Russia, Italy, Persia, and North China are its chief seats.

See Murchison's *Continued Fevers;* Hirsch's *Geographical and Historical Pathology.*

Tyr, the name of a war-god in the old Norse mythology, a son of Odin. He loses his hand in binding the Fenriswolf, and is himself slain in the struggle which slew Garm, the fiercest hell-hound of all. The third day of the week, the *Dies Martis* of the Romans, is called after Tyr, in Old Norse *Týs* (gen. of *Týr*) *dagr;* O.E. *Tives dæg* (the first word being in genitive), from which our English *Tuesday.* The word is of course seen in Lat. *Ju*-piter, Gr. *Zeus*, Sansk. *Dyaus.* See SCANDINAVIAN MYTHOLOGY.

Tyrant (Gr. *tyrannos*), a name given in modern times to an arbitrary and oppressive ruler, but originally applied not necessarily to one that exercised power badly, but merely to one that had obtained it illegally, and therefore equivalent to our word *usurper.* See GREECE, Vol. V. p. 387; GOVERNMENT, and P. N. Ure, *The Origin of Tyranny* (1922).—The THIRTY TYRANTS in Athenian history were a body of rulers invested with sovereign power after the close of the Peloponnesian war. They were all native Athenians, but members of the aristocratical party, and chosen by the Spartan conquerors, who, knowing the animosity existing between the democracy and oligarchy of Athens, hoped to rule the city through the agency of the latter. Their government was a positive 'reign of terror,' marked by the most infamous cruelties. It lasted only one year, when it was overthrown by the return of the Athenian exiles under Thrasybulus. For the Thirty Tyrants in Roman history, see GALLIENUS.

Tyrant-birds (*Tyrannidæ*), a family of passerine birds, chiefly confined to tropical regions. Among the 350 species of which the family consists, there is great diversity of form and even of habit. Noteworthy species are the 'Scissor-tail' (*Milvulus forficatus*), remarkable for its grace of form and beauty of plumage, and the common American Shrike-billed Kingbird or Bee-martin (*Tyrannus tyrannus*). The latter, like all the tyrant-birds, is of a pugnacious temper, and is a determined enemy to sparrow-hawks and other small birds of prey; but it is much disliked by farmers on account of its propensity for eating bees.

Tyrconnel, RICHARD TALBOT, EARL OF, was born in Ireland about 1625, but early crossed to London, and soon gained the favour of the royal family by a readiness for such dirty work as the plot to blacken the reputation of Anne Hyde. At the court of Charles II. he championed the Irish Catholics; on his accession James II. created him Earl of Tyrconnel, with command of the troops in Ireland, and in 1687 appointed him Lord-deputy of Ireland. He strove hard to undo the Protestant ascendency, but the Revolution quickly brought his schemes to nought. In vain he tried to intrigue with William; and on the discrowned king's arrival in Ireland in 1689, the Earl was created Duke of Tyrconnel. After the fatal battle of the Boyne Tyrconnel retired to France, returned in 1691, but died at Limerick in August of the same year. His name occurs in the doggerel ballad of *Lillibulero* (q.v.). In 1679 he had married the widow of Count Anthony Hamilton's brother, elder sister of Marlborough's famous wife. Macaulay blackened his character overmuch. See P. W. Sergeant's *Little Jennings and Fighting Dick Talbot* (1913).

Tyre (Phœn. *Ṣûr* or *Ṣôr*, 'rock'), a city of ancient Phœnicia, situated in 33° 12′ N. lat., which

probably derived its name from the double rock on which it was first founded. There were two towns of Tyre closely connected together in historical times; one on the continent, the other on the island opposite, with an area of 142 acres. The more important of the two was the continental town, called Palætyrus. 'It stands out in the sea, as the palm of the hand does from the wrist,' says an old writer. The situation of the entire city was one of the most fertile, and its magnificent combination of land and sea scenery formed the theme of many an ancient poet and seer.

Its ancient history is already dealt with under PHŒNICIA. Tyre was a city on an island in the sea in the 14th century B.C., when it is described in an Egyptian papyrus as a haven: 'D'ar (Tyre) is its name; water is carried to it in boats; it is richer in fish than in sands.' There is a list of places that traded with Tyre in Ezekiel xxvii., with the names of the articles of commerce, including its famous purple dye. Isaiah called it the 'mart of nations.' Explorations were made here in 1874, 1877, and 1881. Its two ports—the Sidonian to the north, and the Egyptian to the south, each about 12 acres—have been identified by Major Conder, as also the probable site of the old cemetery. Alexander the Great made a causeway from the shore, which has increased in breadth to a quarter of a mile by drifting sand. An aqueduct bringing water from the springs at Ras el-Ain existed previous to 724 B.C. The population of the island city seems to have been crowded together, the houses rising story upon story, so that a larger number might be accommodated. Tyre was enlarged and beautified by Hiram, and sustained sieges by Shalmaneser, Nebuchadrezzar, Alexander (332 B.C.), and Antigonus. Under the Romans, Cleopatra received Tyre as a present from Antony; but the last trace of its independent existence was taken from it by Augustus. A Christian community was founded there at an early period. In St Jerome's time it was again the noblest and most beautiful city of Phœnicia, nay, one of the most prosperous and noble cities of the whole East. In the 7th century it came under the dominion of the Saracens, and so remained until taken by the Crusaders, who defended it till 1291. Soon after it was destroyed by the Moslems; a visitor in 1355 found it a mass of ruins. From the settlement of the Metâwileh or Persian schismatics, in 1766, the town began to be rebuilt. About 6500 inhabitants now dwell among the ruins of its ancient glory, finding scanty livelihood in its insignificant exports. Here Origen and the bones of Frederick Barbarossa are buried.

Tyree', or TIREE, an Argyllshire island, one of the Inner Hebrides, 19 miles NW. of Iona. Having a maximum length and breadth of 12 and 6 miles, and an area of 34 sq. m., it is treeless and flat, with a mean elevation of only 20 feet, except in the south, where three hills attain 400 feet. There are a score of fresh-water lakes. Nearly forty Scandinavian forts dot the shores, and there are also a ruined castle, nine standing stones, &c. Pop. 1700, who rear cattle, fish, and export poultry and eggs.

Tyrnau (Czech. *Trnava;* Magyar *Nagy-Szombat*), a town of Slovakia, on the picturesque Waag valley railway, about 30 miles NE. of Presburg (Bratislava). 'Little Rome' it used to be called, and not inappropriately, when it was the place of residence of the Hungarian primates. Its university (1635–1774) was transferred to Pesth. Pop. 7000.

Tyrol. See TIROL.

Tyrone (*Tir-Eogain*, 'Owen's country'), an inland county in the heart of Ulster, Ireland, 48 miles long, with an average breadth of 28. Area, 779,563 acres, excluding some 32,000 acres of water. The surface in general is hilly, and often extremely picturesque, this county lying for the most part between the two mountainous districts which traverse Ulster from east to west; the highest point is Sawell (2236) in the north-east. With the exception of Lough Neagh (part of which is in Tyrone), the lakes, which are numerous, are small. The principal rivers are the Foyle, Mourne, Blackwater, and the Ballinderry. The geological structure is very much diversified, including mica and primitive limestone in the mountains; old red sandstone occupies much of the plain. Between Dungannon and Stewartstown there is a small coalfield, the produce of which is rich, and new shafts were sunk in 1920; marble is quarried; and there are traces of iron, copper, and lead. The climate is moist, and the low lands are often flooded. The soil of the plain is a well-tilled fertile loam; that of the hilly districts, sandy or gravelly. There is a large proportion of bog. There are manufactures of linens, coarse woollens, earthenware, whisky, and soap. The chief towns are Omagh (the capital), Strabane, Dungannon, Cookstown, and Aughnacloy; Clogher gives its name to the episcopal see both in the Episcopal and Roman Catholic churches. The county along with Fermanagh returns two members to the imperial parliament. Pop. (1841) 313,011; (1881) 197,719; (1911) 142,665—55·4 per cent. Catholics, 22·7 Episcopalians, 18·6 Presbyterians; (1926) 132,775. See ULSTER.

Tyrone, HUGH O'NEILL, EARL OF, 'the arch-rebel,' was the son of an illegitimate son of Conn O'Neill, the first Earl of Tyrone, and was himself in 1587 invested with his grandfather's title and estates. But he soon plunged into intrigues both with the Irish rebels and with Spain against the authority of Elizabeth, and in 1597 assumed the ancient title of 'The O'Neill,' and began the struggle openly. His success soon spread the flame of insurrection over all Ulster, Connaught, and Leinster. The queen sent over Essex with more than 20,000 men, and at Ballyduich Tyrone met him under truce, and submitted his demands to Elizabeth. Lord Mountjoy soon succeeded Essex, and quickly subdued most of the country. But at length in 1601 a Spanish force of 5000 men landed at Kinsale, and 2000 more at Castlehaven. Mountjoy at once besieged Kinsale, while Tyrone advanced to its relief, but was defeated with heavy loss, and severely wounded. Mountjoy pursued him to the north and ravaged his country. After Kinsale fell Tyrone made his submission at Mellefont and was reinstated in his earldom. But under James I. he intrigued anew with Spain, and finally in 1607 found it necessary to flee. His lands were confiscated, and he himself died at Rome in 1616. See IRELAND, Vol. VI. p. 207.

Tyronensians, or TIRONENSIANS, a congregation of Benedictines (q.v.).

Tyrrell, GEORGE (1861–1909), born in Dublin, studied at Trinity College, and having become a Roman Catholic in 1879, entered the Society of Jesus next year and taught philosophy at Stonyhurst. He early distinguished religion as a life and dogma in theology as an inadequate interpretation of that life; became the principal English exponent of 'modernism' (see JESUS), and was expelled from the Jesuit Society in 1906. His criticism of the papal encyclical *Pascendi* condemning modernism led to his practical excommunication, but at his death his friend the Abbé Brémond gave him absolution. Among his works were *Lex Credendi, Through Scylla to Charybdis* (1907), *Mediævalism, Christianity at the Cross*

Roads, Essays on Faith and Immortality (1914). See his *Autobiography* (1912) and his *Letters* (1920), both edited by Miss Petre.

Tyrrhenian Sea, that part of the Mediterranean (q.v.) between Corsica, Sardinia, and Sicily, and the Italian peninsula.

Tyrtæus, who by his elegies sought to still Spartan dissensions, and by his war songs mightily heartened the Spartans in the second Messenian war (657 B.C.), was probably a Spartan—and not, as the Athenians fabled, a lame Athenian schoolmaster sent to the Spartans by the Athenians as being the most inefficient commander they could select. Of a dozen fragments preserved (three of them complete poems) nine are elegiac. They are included in Bergk's *Poetæ Lyrici Græci;* and in Giarratani's *Tirteo* (1905).

Tyrwhitt, THOMAS (1730–86), the first adequate editor of Chaucer, was the son of the archdeacon of London, studied at Eton and Oxford, and in 1762–68 was clerk of the House of Commons. His most important work was his admirable edition of the *Canterbury Tales*, with dissertations, notes, and glossary (2 vols. 1775; 5 vols. 1778). Other books were an edition of Aristotle's *Poetics* (1794), a refutation of the antiquity of the Rowley poems of Chatterton (1778), a dissertation on Babrius (1776), and *Conjectures* on Strabo, on Æschylus, Euripides, Aristophanes, &c.

Tytler, WILLIAM, of Woodhouselee, historian and antiquary, was born at Edinburgh, 12th October 1711, educated at the High School and the university, admitted a member of the Society of Writers to the Signet in 1744, and died 12th September 1792. His best-known works are an *Inquiry into the Evidence against Mary Queen of Scots* (1759; 4th ed. 1790), in which he attempted to vindicate her from the charges brought by Robertson and Hume, and an edition of the *Poetical Remains of James I. of Scotland* (1783).

His eldest son, ALEXANDER FRASER TYTLER, a historical writer, and a judge with the title of Lord Woodhouselee, was born at Edinburgh 15th October 1747, educated principally there, but also at Kensington, and admitted to the Scottish bar in 1770. He obtained in 1780 the chair of History in the university of Edinburgh, in 1790 the office of Judge-advocate of Scotland, and in 1802 was raised to the bench of the Court of Session. His acquirements were of the most varied kind, embracing most departments of literature and the fine arts. His writings include a biography of Henry Home, Lord Kames; a Dictionary of Decisions of the Court of Session; and the work by which he is best known, his *Elements of General History* (1801), which has been translated into most of the languages of Europe, and even into Hindustani. He died 5th January 1813.—*His* fourth son, PATRICK FRASER TYTLER, an eminent historical writer, was born at Edinburgh, 30th August 1791, and educated chiefly there, being called to the Scottish bar in 1813. Of his thirteen works the most valuable is his *History of Scotland* (9 vols. 1828–43), beginning at the accession of Alexander III., and terminating at the union of the crowns, a book of more critical research than any work on the same subject that had preceded it, and itself by no means yet wholly superseded. Others were Lives of the Admirable Crichton (1819), Sir Thomas Craig (1823), Wyclif (1826), Scots Worthies (3 vols. 1831–33), Raleigh (1833), and Henry VIII. (1837), and *Progress of Discovery on the Northern Coasts of America* (1832). In consideration of his merits as a historian, Sir Robert Peel conferred on him in 1844 a pension of £200; and he died at Malvern, 24th December 1849. See Dean Burgon's *Life of Patrick Fraser Tytler* (1859).

Tyumen. See TIUMEN.

Tzana. See TANA.

Tzetzes, JOHANNES, a Byzantine author of the 12th century, wrote some very dull works in prose and verse, which are valuable as storehouses of classical information not elsewhere to be had. The principal are (1) *Iliaca*, consisting of three distinct poems, entitled *Ante-Homerica, Homerica*, and *Post-Homerica* (ed. Bekker, 1816; Lehrs, 1840); (2) *Biblos Istorike*, more commonly called *Chiliades*, or a collection of more than 600 stories, mythical, legendary, &c. (ed. Kiessling, 1826), written in that 'political verse,' which had regard only to accent, and not to quantity; besides commentaries on Homer, Hesiod, and Aristophanes.

Tzintzars. See VLACHS.

Tzu-hsi (1834–1908), empress-dowager of China, wife of the emperor Hien-Jêng (who died in 1861). She became regent for her nephew Kwang-sü in 1875, and was the virtual ruler of China till her death, being largely responsible for the anti-foreign agitation which culminated in the Boxer rising of 1900. See CHINA, pp. 190, 191.

U

the twenty-first letter of the modern English alphabet, and V, the twenty-second letter, both descend from the Greek Y (in modern type Υ, *υ*), which was the first addition made by the Greeks to the alphabet of twenty-two letters which they adopted from a Semitic people. This letter, which originally expressed the sound of *u* (as in *trŭth, pŭt*), probably derived its form from the sixth Semitic letter, which, altered in shape but retaining its primitive value of *w*, continued to hold the sixth place in the early Greek alphabet. (See the articles F and DIGAMMA.) In the later classical period the *u* sound changed into that of the German *ü* or the French *u*. Originally the sound of the letter was used as its name; the mediæval name *ü psīlon* ('bare' or simple *ü*) was probably given by way of distinction from the digraph *oi*, which in late Greek was also pronounced *ü*. In modern Greek the simple letter and the digraph are alike pronounced as *i*.

In early Greek inscriptions the letter sometimes had the form V, which was adopted by the Romans. In Latin it was used to express not only the sound *u* but also the related consonantal sound of the English *w*, or, to speak more accurately, that of the French *ou* in *oui*. This consonant sound developed in late Latin into the voiced labial spirant. The European peoples that inherited or adopted the Roman alphabet continued until modern times to use the letter with the two very dissimilar values of *u* and *v*.

The modern printed U, u, reproduce mediæval MS. forms with the rounded outline naturally developed in writing on soft materials. The minuscule u is in many mediæval MSS. (as indeed in many modern handwritings) quite undistinguishable from n, and for the sake of legibility scribes often occasionally substituted for it a character (which had a variety of shapes) derived from the epigraphic form V. In the 15th century *v* was commonly used initially and *u* non-initially, without regard to the phonetic distinction. The important reform of appropriating *u* to the vowel and *v* to the consonant seems to have originated in Germany at least as early as the 15th century, but was slow in finding general acceptance. It appears in French printed books near the end of the 16th century; in England the Bible of 1611 and the Shakspere folio of 1623 still follow the old rule. Since about 1630 u and v have been used for vowel and consonant respectively, but in dictionaries they were treated as different forms of one letter until the 19th century; in Todd's Johnson (1818), for instance, *Uberous* comes after *Vaward*.

Except in French, English, Dutch, and Welsh, u has retained, approximately at least, its Roman sound—the high-back-round vowel, which is expressed in English by *oo* (long in *root*, short in *good*). In late Gaulish Latin this sound, when long, changed into the high-front-round vowel, which sound the letter has in French. In modern English the normal long sound of u, which serves as its alphabetic name, is *yū*, developed from an earlier sound (still surviving in dialects) which may be written *iw*. As a short vowel u had in Middle English its Latin sound, which it still has in a few words beginning with labial consonants, as *bush, full, put*; for the ordinary English 'short u,' see ENGLISH LANGUAGE, p. 372. In Dutch u is normally pronounced nearly as in French, but in some words its sound approaches the English 'short u.' In Welsh u denotes a peculiar vowel-sound, somewhat resembling the *i* in *pit*.

In several languages u is part of a compound symbol denoting either a simple vowel or a diphthong not consisting of the sounds of the component letters. Such compound symbols are, for instance, the English *au*, the French *au, eu, ou, un*, the Dutch *eu*, and the German *eu, äu*. The German ü (formerly û), more fully written ue, has nearly the sound of the French u.

Ubangi, a river of Equatorial Africa. A tributary of the Congo, it is formed by the union of the Mbomu and the Uele, both of which take their rise in the extreme NE. of the Belgian Congo. The united river forms the NW. boundary of the Belgian Congo, and has a course of some 700 miles to its confluence with the Congo, just south of the equator. The Ubangi is navigable, but the Zongo rapids, about half-way through its course, make continuous navigation impossible. It flows through a populous and fertile country.

Úbeda, a town of Spain, on the plateau between the Gaudalquivir and Guadalimar, 26 miles NE. of Jaén. It contains a large castle, and manufactures cloth, soap, and oil. A flourishing town under the Moors, it witnessed the victory in 1210 of the kings of Navarre and Castile over Abdallah Mohammed of Morocco. Pop. (1920) 22,988.

Ucayali, a river of Peru, one of the head-waters of the Amazon, is formed by the confluence of the Apurimac and Urubamba, and winds more than 1200 miles north to join the Marañon opposite Nauta. It traverses a rich, heavily wooded country, of great heat and moisture, and very unhealthy: enormous areas are flooded during the rainy season. It is navigable for large vessels as high as Sarayacu (6° 30′ S.).

Uccello, PAOLO (1397–1475), the name given to the Florentine painter, di Dono, who, trained as a goldsmith, later devoted himself specially to the study of linear perspective. A passion for abstract geometrical form and a feeling for rich simple colour made him a master of decorative design.

Udaipur, or MEWAR, an Indian state in Rajputana (q.v.); area, 12,756 sq. m.; pop. (1921) 1,380,063. The capital is Udaipur (sometimes spelt *Oodeypore*), picturesquely situated on a ridge overlooking a romantic lake, 140 miles SW. of Ajmere; pop. (1921) 34,789.

Udall, NICHOLAS, author of *Ralph Roister Doister*, the earliest English 'regular' comedy, was born in Hampshire in 1504, was admitted a scholar of Corpus Christi College, Oxford, took his B.A. degree in 1524, and became the stern master of

Eton and of Westminster, and canon of Windsor. He died in December 1556. Neither his translations from Erasmus and Peter Martyr, his *Flovres for Latin Spekynge* (from Terence), nor his lost plays (*De Papatu, Ezekias*) would have preserved his name without his *Ralph Roister Doister*, a merry comedy in the manner of Plautus, licensed and believed to have been printed in 1566, but certainly written at least twelve years before. The plot turns on the gull and coxcomb Ralph Roister Doister's ridiculous and unsuccessful courtship of the comely widow Dame Christian Custance, the intrigues of his parasite Matthew Merrygreek, and the final triumph of the successful suitor, Gawin Goodluck, after his return from sea. Editions are by Arber (1869), Flügel (in Gayley's *Representative English Comedies*, 1903), Farmer (1907), and Thorndike in *Minor Elizabethan Drama* (ii. 1910).

Udal Right. See ALLODIUM, LAND LAWS.

Udine, a walled town of Italy, of mediæval origin, the centre of the district of Friuli, and the capital of a province, lies in a rich agricultural country, 85 miles by rail NE. of Venice. It has wide, handsome streets, and contains a Romanesque cathedral (much altered), an archbishop's palace which contains (as does the church of Sta Maria della Purità) good frescoes by G. B. Tiepolo, and a picturesque piazza, surrounded by a fine Venetian-Gothic town-hall (rebuilt after a fire in 1876), a graceful Renaissance loggia, and a lofty tower. On a hill in the midst of the city is a castle, formerly the residence of the patriarchs of Aquileia, containing the local picture gallery. Giovanni da Udine, one of Raphael's best pupils (see ROME, LOGGIA), was a native of the town. Udine manufactures silk, leather, gloves, hats, &c. Bonaparte resided in the Villa Manin, belonging to the last doge of Venice, at Passariano, close by, during the preliminaries of the peace of Campoformio; and in the Great War Udine was the seat of Italian general headquarters from the declaration of war against Austria until October 1917, when the Austrians occupied it until October 1918. Pop. (1901) 37,942, (1921) 56,041.

Ueberweg, FRIEDRICH, philosopher, was born 22d January 1826 at Leichlingen in Rhenish Prussia, studied at Göttingen and Berlin, and, after teaching in a school at Elberfeld and lecturing at Bonn University, became in 1862 professor at Königsberg, where he died, 9th June 1871. He is best known by his *System of Logic* (1857; Eng. trans. 1871) and his *History of Philosophy* (1863–66; Eng. trans. 1872), a compendious handbook from an empirical and eclectic standpoint. He gained the Vienna Academy's prize for an essay on the authenticity and order of Plato's works; and an essay on Schiller as historian and philosopher was published posthumously. See a monograph by Lange (1871).

Ufa, capital of the Bashkir republic in Russia, stands at the foot of the Urals, 280 miles ESE. of Kazan, on the Biëlaia, a stream which through the Kama falls into the Volga. It is an important agricultural centre. Pop. 84,000.

Uganda, a British protectorate in East Africa, lying on both sides of the equator, and bounded on the N. by the Sudan, on the E. by Kenya Colony, on the S. by Lake Victoria and Tanganyika Territory, on the W. by the Congo. Area, 98,776 sq. m. including 15,017 sq. m. of water (Lake Kioga, and parts of Lakes Victoria, Edward, Albert, &c.). The Nile (q.v.) flows from Lake Victoria over the Ripon Falls, through Lakes Kioga and Albert, and northward to the Sudan. The physical appearance of Uganda is very diversified. The north is mostly flat (except in the centre), hot, arid; the country between Lakes Victoria and Kioga is marshy, fertile, moist, and rises eastward with luxuriant tropical vegetation through forest land to the volcanic heights of Mount Elgon (now extinct); the south-west, dominated by the snowy Ruwenzori (q.v.) range is more healthy. The rainfall increases from very little in the NE. to about 100 in. per annum in the SW. Different varieties of big game are found throughout the country. Pop. about 3,150,000 of whom about 700,000 belong to the Baganda, an intelligent, Christianised people; the rest are Masai, Nilotic and Sudanese peoples, while some Congo pigmies are found near the Semliki River. About two-thirds of the total population speak Bantu languages. The Protectorate is under direct administration located at Entebbe, but the natives are given a certain amount of autonomy, and the province of Buganda along the north-west shore of Lake Victoria is recognised as a native kingdom with the capital at Mengo. There are native and European courts of justice, while the governor is assisted, since 1920, by executive and legislative councils. The government now supplements the educational work of the various missionary societies. Enormous quantities of cotton are exported, more than 600,000 acres being under native cultivation, mostly in eastern Uganda, and other important products are coffee, rubber, chillies, oil-seeds, skins, and ivory. Iron is found in most parts. Textiles and machinery are the principal imports, but the customs have been amalgamated with those of Kenya Colony since 1917, and in 1926 Kenya took over temporarily the administration of the inhospitable Rudolf region in the NE. The Busoga railway runs from Jinja on Lake Victoria north to Namasagali on the Victoria Nile, while from Nakuru (in Kenya (q.v.) and directly communicating by rail with Mombasa) one branch extends to Kisuma on Lake Victoria (finished in 1902) and another (under construction) to Mbulamuti on the Busoga railway. There are busy steamer services on the great lakes.

Uganda was first visited (1862) by Speke and Grant, and by Stanley (q.v.) was called the 'Pearl of Africa.' At the request of King Mutesa, English Protestant missionaries settled in 1877, and French Catholics followed in 1879. The native Christians had much to endure from Mutesa's son, King Mwanga, by whose orders hundreds were murdered. The presence of Arabs and Mohammedanism further complicated matters, and intestine struggles were not long in breaking out. Dr Peters tried to extend German influence hither, but the Imperial British East Africa Company regarded Uganda as being within the British sphere under the Anglo-German agreement of 1887, and that it was so was settled between England and Germany in 1890. In 1894 a British protectorate was proclaimed over Uganda proper (Buganda), and extended 1896–1901 over most of the present protectorate, but various frontier modifications have since taken place. King Mwanga of Uganda rebelled in 1897, and, being defeated, fled to German territory; his infant son was recognised by the British government as ruler under a native council. In 1897 also part of the Sudanese troops in the protectorate mutinied, and were only suppressed after many months' severe fighting. The principal events of the 20th century have been the destructive outbreaks of sleeping-sickness 1901–09, the opening of the Busoga railway (1912), the loyal co-operation of the natives with the British during the Great War, and the extensive development of the country, making it financially self-supporting since 1916.

See the Travels of Speke, Stanley, Burton, Emin Pasha, &c.; general books on Uganda by Felkin and

Wilson (1881), Cunningham (1905), Wallis (1920); Sir F. Lugard, *Rise of our African Empire* (1893); Ashe, *Chronicles of Uganda* (1894); Colville, *Land of the Nile Springs* (1895); Ansorge, *Under the African Sun* (1899); Sir H. Johnston, *Uganda Protectorate* (1902); Purvis, *Through Uganda* (1909); Kmunke, *Quer durch Uganda* (1913); Driberg, *The Lango* (1923); various books by Roscoe, including *The Northern Bantu* (1916) and *The Bagesu and other Tribes* (1924).

Ugolino, COUNT, head of a family long dominant in Pisa, which backed the people against the nobles, and as Ghibellines were the irreconcilable enemies of the Visconti, who headed the Guelphs. The most famous of this family is Count Ugolino della Gherardesca, whose name and fate have been invested with undying interest by Dante. Having resolved to usurp supreme power over Pisa, he formed an alliance with Giovanni Visconti, the head of the Guelphic party. The plot was, however, discovered, and both Giovanni and Ugolino were banished from the city. The latter, uniting himself with the Florentines and the Lucchese, forced the Pisans in 1276 to restore to him his territories, of which he had been deprived. No sooner was he reinstated in his possessions than he began to devise anew ambitious schemes. The war of the Pisans with the Genoese afforded him the opportunity he desired. In the battle fought at the island of Malora, 6th August 1284, Ugolino, by treacherously abandoning the Pisans, occasioned the complete annihilation of their fleet, together with a loss of 11,000 prisoners. When the news of this disaster spread, the Florentines, the Lucchese, the Sienese, the Pistoians, and all the other enemies of the Pisan republic gathered together to destroy it, as the stronghold of the Ghibellines in Italy. Being thus brought to the brink of ruin, the Pisans had no other resource left than to throw themselves into the arms of him whose treachery had reduced them to such misery. From the time of his election he gave free scope to his vindictive, despotic nature, persecuting and banishing all who were privately obnoxious to him, on pretext of state delinquency, till at length a conspiracy was formed against him, headed by his former supporter, the archbishop. Dragged from his palace, 1st July 1288, after a desperate defence, he was thrown into the tower of Gualandi, with his two sons and two grandsons, where they all perished amid the agonies of starvation, for which reason their dungeon has since borne the ominous name of the 'Tower of Hunger.' In spite of this, the family again rose into importance; and in 1329 we find a Gherardesca at the head of the republican authority in Pisa.

Ugrians. See PHILOLOGY, Section III., p. 100.

Uhland, JOHANN LUDWIG, German poet, was born at Tübingen, 26th April 1787. When a young man at the university of his native place his mind was divided between law and ancient German literature. The latter was his favourite pursuit, and he began to publish poems at an early age, his first collection of *Gedichte* appearing in 1815. To this he kept adding all the rest of his life. Other productions of Uhland's are admirable essays, *Ueber Walther von der Vogelweide* (Stuttg. 1822) and *Ueber den Mythus von Thor* (1836); a most valuable collection of old popular songs, *Alte hoch- und niederdeutsche Volkslieder* (1844–45); *Schriften zur Geschichte der Dichtung und Sage* (8 vols. 1866–69); and two respectable dramas, *Herzog Ernst von Schwaben* (1818) and *Ludwig der Baier* (1819). He died at Tübingen, 13th November 1862. Uhland was a patriotic politician as well as a poet. He entered the representative assembly of Württemberg in 1819 as liberal deputy from Tübingen, and was also a delegate to the Frankfort Assembly of 1848; but though Germany has reason to be grateful for his services to the cause of constitutional liberty, it is as a poet he is best remembered. His pieces are full of spirit, spontaneity, and truth, finely picturesque in their sketches of nature, and exquisite in their varied tones of feeling. Nothing, indeed, can surpass the brevity, vigour, and suggestive beauty of his ballads, in which a romantic sweetness of sentiment and a classic purity of style are happily combined. Uhland is the acknowledged head of the 'Swabian school' of German poets. Longfellow translated some of his ballads in *Hyperion;* and translations by Platt (1848), Skeat (1864), and Sandars (1869) have also appeared. See Lives by his widow (1874), Dederich (1886), Holland (1886), and H. Fischer (1887).

Uhlans, or ULANEN, a name (derived through Polish from Turkish-Tatar) originally given to light cavalry armed and clothed in semi-oriental fashion. A body of Uhlans was formed for the French army by Marshal Saxe. But the word is now best known as a term for the German heavy cavalry armed with the lance, famed for dash, bravery, and swiftness of movement during the Franco-German war. The distinction between Uhlans and other cavalry is now one of uniform and tradition only.

Uigurs, a Turkish people of Eastern Turkestan who long preserved a separate identity. See GENGHIS KHAN.

Uintah Mountains. See ROCKY MOUNTAINS.

Uist, NORTH, an island of the Outer Hebrides, 65 miles SSW. of Stornoway. It is 18 miles long from west to east, and from 3 to 13 miles in breadth. The eastern half of it is so cut up by lochs and watercourses as to have the appearance of an archipelago—a brown, peaty, dreary bog, partly relieved, however, by a line of hills (1133 feet) running along the coast. In the west part, which as a rule is hilly (1500 feet), there is a tract of uneven, low land, exceedingly beautiful in certain seasons, rendered fertile by the drifting of shell-sand from the coast, and producing good clover and grain crops. Pop. (1921) 2579.—SOUTH UIST, 36 miles SW. of Lochmaddy in North Uist, Benbecula lying between them, has a maximum length and breadth of 22 and 7¾ miles. Its east coast is much indented by Lochs Skiport, Eynort, and Boisdale. The eastern district is hilly (2035 feet); the western is alluvial and productive under proper treatment. Pop. (1921) 3235, crofters, engaged in fishing and agriculture, and almost all Catholics.

Uitenhage (now pronounced *Yootenhaig*), capital of a district in the Cape Province, is 25 miles NW. of Port Elizabeth by rail. It has woollen mills, railway shops, and some fine buildings. Pop. (1921) 14,183.

Ujiji, a district on the eastern shore of Lake Tanganyika. The town is the terminus of the great caravan route from Zanzibar, and has long been an important Arab station. In 1890 it came within the German sphere of influence, and is now a town of Tanganyika Territory.

Ujjain, a walled town of Central India, in the state of Gwalior, anciently the capital of Malwa, and one of the seven sacred cities of the Hindus, stands on the right bank of the Sipra, 30 miles N. of Indore. It is 6 miles in circumference, and contains a palace and exports opium. Pop. (1921) 43,908.

Ujpest ('New Pest'), a north-eastern suburb of Budapest; pop. (1920) 56,489.

Ujvidék. See NEUSATZ.

Ukase, or OUKAZ (Russ. *ukasáty*, 'to command,' 'to speak'), a term applied in Russia to all the orders or edicts, legislative or administrative, that emanated from the tsar directly or from the

senate. The term was not extended to the orders of ministers.

Ukraine, a Russian republic and an original constituent member of the Union of Socialist Soviet Republics (formed 1923), includes the autonomous Moldavian republic (established 1924), and consists of most of the former Little Russia and parts of West Russia and White Russia. After the World War portions of former West Russia were annexed by Poland, while Bessarabia, still claimed by the Soviet Union, was occupied by Rumania. The people are mostly Ruthenians (q.v.), and there are some Jews. The soil of the Ukraine, part of the great Southern Steppes, drained by the middle Dnieper and its tributaries, is extremely rich and fertile. Large crops of wheat, oats, barley, rye, and maize are grown, and the manufacture of sugar-beet and the rearing of livestock are very important. Huge deposits of coal, anthracite, iron, quicksilver, manganese are found, and there are various large iron and steel works (see RUSSIA, *Little Russia*). The majority of the people belong to the Orthodox church. Education is at a high level. The land is mostly split up into peasant farms. The constitution of the republic is the same as that of Russia proper (see RUSSIA, *Government*). Area, 165,854 sq. m.; pop. (1926) 28,887,919. The capital is Kharkov (310,000), and other large towns are Kiev (409,000), Odessa (317,000), Ekaterinoslav (169,000), Poltava (88,000). The name Ukraine (Polish, 'frontier country') was given in Poland first to the frontiers towards the Tatars and other nomads, and then to the region on both sides of the middle Dnieper, without any very definite limits. The Ukraine has long been a bone of contention between Poland and Russia. About 1686 the part on the east side of the Dnieper was ceded to Russia, and at the second partition of Poland (1793) the western portion also fell to Russia. In November 1917 a republic was proclaimed in the Ukraine, and Ukrainian delegates negotiated at Brest-Litovsk (q.v.) in March 1918 with the Central Powers, who occupied the country against the Bolsheviks till November 1918. Subsequently Polish and 'white' troops strove with the Bolsheviks for possession, but by October 1920 a Socialist Soviet republic was definitely established and, by the Treaty of Riga, its independence recognised by Poland and Russia proper. For other sections of the same people, see RUTHENIANS, PODKARPATSKÁ RUS.

See general books on the Ukraine in English by Sands (1914), Rudintzky (1918), in French by Kordouba (1919), Stebnitsky (1919); also the work on Ukrainian literature by Tyszkiewicz in French (1919).

Ukulele, a small four-stringed Guitar (q.v.) introduced by Portuguese labourers in the Hawaiian Islands, where it took the fancy of the natives. Subsequently it was adopted largely by Americans and Europeans for dance and jazz-music, being especially popular after the Great War. In South America it is called a Machita, while the ukulele-banjo is constructed like a miniature banjo but tuned and played like the ukulele.

Ulcers (Lat. *ulcus*, 'a sore spot'). Ulceration is 'that part or effect of an inflammatory process in which the materials of inflamed tissues, liquefied or degenerate, are cast off, in solution or very minute particles, from free surfaces, or, more rarely, are absorbed from the substance of the body' (Paget on 'Ulcers,' in Holmes's *System of Surgery*). Generally speaking, however, the name of ulcer is not applied to any inflammatory result, unless the substance of a tissue deeper than the epithelial is exposed; and when the cast-off particles are only epithelial the result is termed desquamation, abrasion, or excoriation, although the process may be essentially the same. Ulceration is closely allied to gangrene, the two processes differing in degree rather than in kind. 'When the degenerate or dead substance,' says Sir J. Paget, 'is cast off in one or more portions visible to the naked eye, the process is usually called gangrene; when the portions are not so visible, or are quite dissolved, it is called ulceration.' The degenerate tissues are always suspended or dissolved in a liquid, termed the 'discharge,' or 'ichor,' which varies in appearance and properties according to the cause and characters of the ulcerative process. From some ulcers, e.g. the primary syphilitic, it is contagious; and from foul ulcers the organisms in the discharge are liable to produce septic changes in other wounds.

Ulcers may occur on any surface of the body—e.g. the eye, mouth, stomach, intestines, &c.: here attention will be restricted to ulcers on the skin. They may be classified according either to their obvious characters or to their cause. It is most convenient in the first instance to adopt the former arrangement.

A *common, simple,* or *healthy ulcer* is such as is left after the separation of an accidental slough in a healthy person, and is merely a healthy granulating surface, tending to cicatrisation. Its edges shelve gently down to the base, and are scarcely harder than the adjacent healthy skin. Their surface near the border is of a purplish blue tint where the young epidermis modifies the colour of the healing granulations; and within this the granulations have a deeper hue than those at the centre, being most vascular where the cuticle is being chiefly developed. The discharge from such an ulcer is slight or non-existent. *Inflamed ulcers* differ less than most kinds from the above-described common or healthy ulcers. Their most common seat is on the lower half of the leg or shin. The surface is red, and bleeds easily; the discharge is thin and watery; the edges irregular or shreddy; and the surrounding skin shows a red tinge, and is the seat of a hot and aching sensation. This ulcer most commonly occurs in the infirm and old, the ill-fed and overworked. Hence constitutional treatment, good diet, and complete rest (with elevation of the limb) are here necessary. *Sloughing ulcers,* in the mildest form, are characterised by an aggravation of the symptoms observed in inflamed ulcers; while the surface becomes gray and is cast off in shreds, and the ulcerative process extends rapidly. They are generally associated with a debilitated state of the system. *Phagedæna* (Gr., from *phagein,* 'to eat or corrode') is an old name for a severe sloughing ulcer in which there is much infiltration, and at the same time rapid destruction of the affected part, with severe constitutional symptoms. The sore presents an irregular outline, and a gray or yellowish surface; it gives off a profuse bloody or ichorish discharge, and is extremely painful. Severe forms of this ulceration were apt to break out in hospital about the middle of the 19th century in connection with the slightest wounds; and before the use of antiseptics and modern improvement of hospital management these cases formed the fatal and dreaded hospital gangrene. It was usually engendered by the overcrowding of sick and wounded men; and some idea of its virulence may be formed from the fact that on the return of the French fleet from the Crimean war, no less than sixty deaths from it occurred in one ship in the course of thirty-eight hours. *Weak ulcers* are those in which the granulations are prominent, pale, and soft. They are generally met with in persons of weakly physique. *Exuberant* or *fungous ulcers* have also prominent granulations (popularly called 'proud flesh'), but they are firm and bright red like those of a healthy ulcer. They are most often seen in

the healing of severe burns. The *chronic, indolent,* or *callous ulcer* gives great trouble to the poor-law medical officer and the workhouse surgeon. It is usually seated in the lower half of the leg, and is most commonly of an oval form, with its long axis parallel to that of the leg. This type of ulcer was also more common in severer form during the 19th century than it is at the present day. The following are the characters of an aggravated case: 'Its base lies deep, and is flat, pale, or tawny and dusky, with very minute or no visible granulations. The margin is usually abrupt, or unequally shelving, or more often thickened, smooth, and rounded. Both the margin and all the surrounding integuments, often for many inches round, are thickened, hardened, "callous," as with a kind of very firm œdema.' Many volumes have been written on the proper means of treating this form of ulcer. Sir James Paget, from whose Memoir we have quoted, especially recommends opium, regulated pressure, and blistering. The pressure is applied with straps of adhesive or lead plaster on linen, or with an elastic bandage. The object of blistering is not only to stimulate the ulcer, but to soften its callous edges by causing absorption of part of the exudation with which they are infiltrated, and desquamation of the cuticle which covers them. The expediency of healing old ulcers of this kind has often been called in question, inasmuch as serious diseases are said to have followed the healing of such ulcers. In the great majority of cases, however, no untoward results are met with.

The recognition of the *causes* of an ulcer are, however, of even more importance than the characters it presents; for that determines the methods to be employed in order to cure it. It may result from chemical or mechanical injury; from defective circulation, particularly the existence of Varicose Veins (q.v.); and in each of these cases the local cause must be attended to. But it may originate or be kept from healing by a constitutional cause, syphilis, tuberculosis, scurvy, or gout; and if so constitutional treatment is of prime importance. Ulceration is also a frequent incident in the progress of malignant, particularly cancerous, tumours. But there is one form of disease, now proved to be cancerous, in which the tumour formation is so slight, and the ulceration so prominent, that it has generally been known under the name of *rodent ulcer*. It generally occurs in the upper part of the face. In recent years exposure of the ulcer to the prolonged action of radium enclosed in a small capsule has been found to combine the destructive and stimulating action necessary for its cure.

In the *local treatment* of ulcers generally, as of other breaches of surface, the most scrupulous cleanliness is of prime importance; and here, no less than in other departments of surgery, the use of the antiseptic method (see ANTISEPTIC SURGERY) has proved of the greatest value as a means of attaining this end. The particular form of antiseptic most suitable depends on the condition of the sore; in healing ulcers boracic ointment, or if the ulcer be too dry a wet boracic-dressing, usually does well; in inflamed and sloughing ulcers much stronger applications are required. Prominent granulations are generally best treated by the occasional application of solid nitrate of silver or sulphate of copper or of the latter in the form of red lotion.—Ulcer of the stomach is treated at STOMACH.

Uleåborg (Finn. *Oulu*), the chief seaport town of northern Finland, capital of an administrative district, stands on the south bank of the Uleå (Oulujoki), on the eastern shore and near the head of the Gulf of Bothnia. It was founded in 1605. It has leather and shoe factories. In 1854 an English flotilla burned the government property in the place. Pop. 22,000, Finnish speaking.

Ulema (Arabic, plur. of *'âlim*, 'learned' or 'wise'), the collective name (which cannot be used as a singular) designating the body of professional theologians and doctors of divinity, and therefore of law, in a Mohammedan country. They formed the legal and judicial class, and interpreted the Koran and the law derived therefrom; they also constituted whatever there is of the nature of a hierarchy in Islam, and their power and influence have often curbed the irresponsible authority of a despot. There were necessarily Ulema in every Mohammedan city, but the most renowned were the Ulema of Constantinople, of Mecca, and of the Azhar university at Cairo. The Ulema of Turkey were the best organised, and possessed many privileges and immunities. They included (apart from the *softas*, a species of undergraduates training for the rank of Ulema) the *imâms* or readers of the public prayers at the mosques; the *muftis* or doctors of the law, who acted partly as barristers, partly as assessors in the courts; and the *kâdis* or *mollas*, who were the regular magistrates, and were under the authority of two chief-justices, the *kâdi asker* of Europe and of Asia; whilst over them all stood the Grand Mufti or *Sheikhu 'l Islam*, the spiritual head (under the Khalif) of orthodox Mohammedanism and supreme judge of the Ottoman empire. The verdicts or decisions of the Ulema were called *fetwas*. The Ulema have formed the ultra-conservative party in all Mohammedan countries; their interpretations of the Koran, when honest, were rigidly and pedantically in accordance with established tradition, but as individuals they were far from incorruptible. To them more than to any other class was due the lifeless formalism that generally prevailed in Mohammedan countries, and they were the prime movers in all outbreaks of fanaticism. After the Great War, the government of Turkey (q.v.) was secularised, and the functions of church and state were separated. In 1924 the khalifate was abolished, and in 1926 the Ulema were suppressed, only leaving one *imâm* for each mosque.

Ulianov. See LENIN, SIMBIRSK.

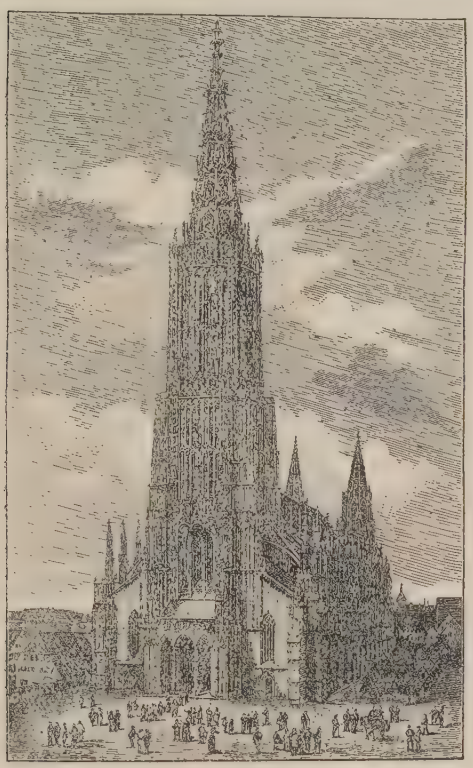
Ulfilas. See ULPHILAS.

Ullmann, KARL, Protestant theologian, was born at Epfenbach near Heidelberg, 15th March 1796, and except during the years 1829–36, when he was professor at Halle, spent most of his life as student and as professor at Heidelberg, where he represented a 'Mediation school' of theology. He died 12th January 1865. His best known works are on *The Sinlessness of Jesus* (1841; 7th ed. 1863; Eng. trans. 1870) and *Reformers before the Reformation* (2d ed. 1860; Eng. trans. 1841–42). He also wrote against Strauss, and on the essentials of Christianity (1849; 5th ed. 1865). There is a monograph by Beyschlag (1867).

Ullswater, after Windermere the largest of the English Lakes, between the counties of Cumberland and Westmorland, 5½ miles SW. of Penrith and 11 ESE. of Keswick. Lying 476 feet above sea-level, it is 9 miles long, ¼ to ¾ mile broad, and 205 feet in maximum, 83 in average depth. It is divided into three reaches, which increase in beauty and grandeur as one goes up it from Pooley Bridge to Patterdale, a chief feature of the landscape being the lofty mountain Helvellyn (q.v., 3118 feet), which rises from the south-west extremity of the lake. Gowbarrow, on the west side (with Aira Force), is a national park. See the map and the works cited, at LAKE DISTRICT.

Ulm, the second city of Württemberg, 58 miles SE. of Stuttgart and 91 WNW. of Munich, on

the left bank of the Danube, which here receives the Blau and the Iller and becomes navigable. On the Bavarian side of the river is Neu-Ulm, with 12,000 inhabitants. Ulm till the war of 1866 was a fortress of the Germanic Confederation, garrisoned by troops of Württemberg, Austria, and Bavaria. Its fortifications (1842–66) have since been greatly extended. The Protestant cathedral



Ulm Cathedral.

is remarkable for architectural beauty, and is, next to the cathedral of Cologne, the largest church in Germany. It is 455 feet long, 186 broad, and 134 high; the tower and open-work spire (530 feet, the highest in the world; see SPIRE) was only completed on 30th June 1890. The cathedral was begun in 1377, and carried on until 1494; its restoration was undertaken in 1844, and it has a fine sculptured doorway, beautiful stained glass, carved choir stalls, and a splendid organ (1856–88). Other edifices are the 16th-century town-hall, the municipal museum of art and antiquities, and many interesting specimens of old domestic architecture. Leading industries are the manufacture of cotton, woollen, and other textiles, of paper, leather, beer, &c. Ulm is famed, moreover, for ornamental pipe-bowls and pastry called Ulmerbrot. Pop. (1871) 26,290; (1925) 56,816. The Romans had a settlement at this important point. In 1531 the city accepted the Reformation. Ulm was in October 1805 the scene of the defeat by Ney of General Mack, and of his surrender with 28,000 Austrians. In 1802 it was attached to Bavaria, and in 1810 became part of Württemberg.

Ulmaceæ, a family of trees, tropical and temperate, akin to the nettles. For Ulmus, see ELM; for Celtis, NETTLE-TREE. The South American *Trema micrantha* is a fibre plant.

Ulphilas, or WULFILA, the translator of the Bible into Gothic, was born about 311 A.D. among the Goths north of the Danube. Consecrated a missionary bishop to his fellow-countrymen by Eusebius of Nicomedia in 341, after seven years' labour he was forced to migrate with his converts across the Danube. For over thirty years he laboured in Lower Mœsia, at the foot of the Hæmus, visited Constantinople in 360 in the interest of the Arian party, and again in 381, only to die a few days after his arrival. For the history of the great monument of Teutonic philology which renders his name for ever memorable, see GOTHS.

See the Lives by Waitz (Hann. 1840) and Bessel (Gött. 1860), the Hulsean Essay by C. A. Scott (1885), and H. M. Gwatkin, *Studies of Arianism* (1882).

Ulpianus, DOMITIUS, a celebrated Roman jurist, born at Tyre about 170 A.D., who held juridical offices under Septimius Severus and Caracalla, and, on the accession of Alexander Severus (222), became his principal adviser and *præfectus prætorio.* He was murdered in a mutinous riot by his own soldiery in 228. Ulpian was a voluminous writer, and as a jurist he takes the first rank after Papinian. In the *Digest* of Justinian there are no fewer than 2462 excerpts from Ulpian, forming about a third of the whole. Of the originals, which are almost entirely lost, the principal were *Ad Edictum*, a commentary on the Edict in eighty-three books, and *Ad Sabinum*, a commentary on the *Jus Civile* in fifty-one books. The so-called *Fragmenta* of Ulpian, first published at Paris by Tilius in 1549, consist of twenty-nine titles —the *Tituli ex Corpore Ulpiani*, edited by Hugo (Berlin, 1834) and Böcking (Bonn, 1836). See Abdy and Walker, *The Commentaries of Gaius and the Rules of Ulpian* (1870; 3d ed. 1885); Muirhead, *Institutes of Gaius and Rules of Ulpian* (1895).

Ulrici, HERMANN, a German writer on philosophy and æsthetics, was born at Pförten in Lower Lusatia, 23d March 1806, studied law at Halle and Berlin, but early devoted himself exclusively to literature and philosophy. In 1834 he was appointed to a chair at Halle, and there he laboured till his death, 11th January 1884. In philosphy he belonged to the theistic school of Fichte the younger, Wirth, and Carriere, revolting from the pantheistic tendencies of Hegel's idealistic rationalism. His first work was his *Geschichte der hellenischen Dichtkunst* (1835), which was followed by a very ingenious essay, *Ueber Shakspeare's dramatische Kunst* (1839; Eng. trans. 1846). Other works are *Ueber Princip und Methode der Hegelschen Philosophie* (1841); *Das Grundprincip der Philosophie* (1845-46); and a *System der Logik* (1852). His books *Glauben und Wissen* (1858), *Gott und die Natur* (1862), *Gott und der Mensch* (1866), and *Leib und Seele* (1866) naturally appealed to a wider circle of readers. Further Shakespearian studies were an edition of *Romeo und Julia* (1853) and a *Geschichte Shakspeares und seiner Dichtung* in vol. i. of the German Shakespeare Society's version of the Schlegel-Tieck translation (1867).

Ulster (Lat. *Ultonia*), the most northern of the four geographical provinces of Ireland, is divided into nine counties—Antrim, Armagh, Down, Fermanagh, Londonderry, Tyrone (which constitute Northern Ireland), and Cavan, Donegal, Monaghan (which form part of the Irish Free State). Each of these counties is separately described. Ulster seems to have formed one of the most ancient divisions of Ireland, and was the seat of the Hy-Nialls or O'Neills, as well as of the lesser septs of O'Donnell, O'Cahan, O'Doherty, Maguire, MacMahon, &c. The north-eastern portion, now the county of Down, was early overrun by John de

Courcy, and subsequently by Hugh de Lacy, and was the most permanent seat of English power in the north; but although various efforts were made by the English to effect a permanent settlement in the north and north-west, the success was but nominal until the reigns of Elizabeth and of James I., when the plantation of Ulster was effected. Of this gigantic scheme of colonisation the chief seat was the county of Londonderry (q.v.). The Scottish element has long been dominant in some parts of Ulster, especially the north-east, but is very unequally distributed. Ulstermen had a very important share in extending the area of civilisation and culture in the United States. When about 1720 the great exodus of Irish Protestant Nonconformists began (100,000 are said to have crossed the Atlantic in ten years) the English settlements south of New England consisted of the strip of country east of the Alleghanies. Scoto-Irishmen formed the vanguard that penetrated beyond amongst the dreaded Indians, and were the main stock from which descended the backwoodsmen and fighting farmers who for fifty years bore the brunt of Indian warfare. In 1861 the population of the whole of Ulster was 1,914,236, of whom about half were Roman Catholics; in 1891 the total was 1,619,814; in 1926, 1,556,423, of whom rather less than a half were Roman Catholics. Protestantism is strongest in the NE. of Ulster, and Roman Catholicism in the SW. The presence of so many Protestants led to diversity of feeling and aims between Ulster and the thoroughly Catholic parts of Ireland; when the Irish Free State was founded after the Great War, six counties from Ulster elected to break off and form Northern Ireland (see IRELAND, *History*). Flax-spinning provides large quantities of damask and fine linen, about three-quarters of the linen trade of the United Kingdom being located in Northern Ireland; over 100,000 persons are employed, but much Flax (q.v.) has to be imported. Belfast (q.v.), one of the principal ports of the United Kingdom, is famous for its huge shipbuilding yards and engineering works. Other manufactures are aerated waters, spirits, tobacco, ropes. For the physical aspects, and for statistics as regards population, agriculture, manufactures, &c., see the relevant sections in the article IRELAND; see also the section on the *Irish Church* for early ecclesiastical history. The order of baronets, nominally founded for the defence of Ulster, had the 'bloody hand' of the O'Neills, the Ulster arms, given them as their cognisance (see BARONET). For the Ulster Herald, see HERALD. See also ORANGEMEN, and articles on various prominent historical figures, TYRCONNEL, TYRONE, &c.; the books cited at IRELAND, also Harrison, *The Scot in Ulster* (1888), and J. W. Good, *Ulster and Ireland* (1919).

Ultimus Hæres, in Law, means the crown or the state, which succeeds to the property of those who die without leaving next of kin, or who, being bastards, have no next of kin.

Ultramarine. See BLUE.

Ultramicroscope. See MICROSCOPE.

Ultramontane (Lat., 'beyond the mountains'—the Alps—namely, in relation to France), that party in the Church of Rome which assigns the greatest weight to the papal prerogative. See GALLICAN CHURCH, INFALLIBILITY, OLD CATHOLICS, PIUS IX., POPE. (Italians of course use the word in a converse geographical sense for people beyond the Alps and so in the north of Europe.

Ultra-violet. See SPECTRUM.

Ulugh-Beg, the grandson of Tîmûr, or Tamerlane (q.v.), governed Western Turkestan as regent for his father Shah Rokh, while the latter was employed in regulating the affairs of the southern half of the empire, and succeeded in 1447 to the imperial throne on his father's death. He was a successful warrior, as every ruler of this period had to be, but happened, unfortunately, to conceive suspicions of the loyalty of his eldest son, suspicions founded only upon astrological indications. The offended and injured prince rebelled, defeated and captured his father, and soon after caused him to be put to death, thus fulfilling the prediction, 1449. Ulugh-Beg is known to posterity as the founder of the observatory at Samarkand, as the liberal patron of astronomers, and as himself a most diligent observer. The astronomical tables which bear his name, in all probability compiled by himself and his fellow-labourers, enjoy a high reputation for accuracy. The astronomical works of Ulugh-Beg were written in Arabic, afterwards translated into Persian, and thence the chronological portion of them rendered into Latin (Lond. 1650) by Greaves, who followed with a Latin version of the geographical part in 1652. An independent version of the same work in Latin and Persian was published by Dr Thomas Hyde, at Oxford, in 1665. A new edition of Ulugh-Beg's catalogue of stars will be found in the *Memoirs of the Royal Astronomical Society*, vol. xiii. Some of Ulugh-Beg's coins have been published by S. Lane-Poole, *Catalogue of Oriental Coins in the British Museum*, vol. vii., and *Additions*, part ii.

Ulundi. See ZULUS.

Ulverston (locally *Ooston*), a market-town of Lancashire, in the district of Furness, near the influx of the Leven estuary into Morecambe Bay, 8½ miles NE. of Barrow-in-Furness and 22 NW. of Lancaster. It stands in an extensive agricultural and mining district, has a ship-canal 1 mile long, and manufactures iron, paper, boots, &c. Pop. 10,000.

Ulwar. See ALWAR.

Ulysses (also *Ulyxes* or *Ulixes*), the Latin form of the Greek ODYSSEUS, the name of one of the most celebrated heroes of the Trojan war. A son either of Laertes or of Sisyphus and Anticleia, he married Penelope, and by her became the father of Telemachus. Agamemnon visited Ithaca and with difficulty prevailed on Ulysses to take part in the Trojan expedition. Later traditions represent him as feigning madness in order to escape, but in vain. He brought with him twelve ships, and during the siege showed himself equal to any of the chiefs in courage, and superior to all in prudence and ingenuity of resource. His adventures after the fall of Troy form the subject of the Homeric poem called the *Odyssey*. Of these the most remarkable befell in the country of the Lotus-eaters, where the companions of Ulysses ate of the wondrous fruit, and wished to rest for ever; the island of the Cyclops, where he escaped with difficulty from Polyphemus; the island of Ææa, inhabited by the sorceress Circe, with whom he sojourned a year; the country of the Cimmerians, where darkness reigns perpetually; the perilous island of the Sirens, the fatal charms of whose singing he resisted by lashing himself to the mast and stopping his men's ears with wax; the alternate horrors of Scylla and Charybdis; the island of Ogygia, where he lived eight years of quiet happiness with the nymph Calypso; and the shores of Scheria, the island of the Phæacians, where in his shipwrecked condition he was succoured by Nausicaa, daughter of King Alcinous. At length he reached Ithaca, and in his beggar's disguise was recognised by his nurse and by his old dog Argus alone. Aided by Telemachus and the swineherd Eumæus, he slew all the insolent suitors of his faithful wife, Penelope. See Lamb's *Adventures of Ulysses*, with introduction by A. Lang (1890).

Umâ, another name for the goddess Kâlî, wife of Śiva (q.v.).

Uman, a town of Ukraine, 120 miles S. of Kiev, on the Umanka; pop. 44,000.

'Umar Khayyám. See OMAR KHAYYÁM.

Umballa, or AMBÁLA, a city of India, capital of a district of the same name in the Punjab, 150 miles N. by W. of Delhi. The new part of the town has wide roads, monotonously straight, and a handsome church, club-house, and hotels. It is an important railway junction, and carries on a very large trade. The cantonment is 4 miles SE. At Umballa Shere Ali was received at a grand durbar in March 1869. Pop. (1921) 76,326.

Umbelliferæ, a large and important family of dicotyledons, abounding chiefly in the temperate regions of the northern hemisphere. A peculiar regularity distinguishes the inflorescence of most of them—a number of stalks radiating from a common centre at the top of the stem or of a branch, each of which bears a flower at its extremity, thus forming what is called an *umbel*. The umbel is usually compound, the primary stalks dividing again, and forming *secondary umbels* or *umbellules*. The flowers are generally small, although the umbel which they compose is often large. The five sepals are usually extremely small. The five petals, often larger on the outer side of the flower, are generally white, rarely yellow, still more rarely red, though frequently tinged with pink at the edges. There are five stamens and two carpels. The ovary has a disk on the top, prolonged into two short styles. The fruit is very peculiar, and consists of two one-seeded, unopening carpels, rarely fleshy, touching one another on the inner side, and there attached to a little column (the *carpophore*), their common axis, and afterwards splitting apart. The Umbelliferæ are mostly herbaceous plants with hollow stems, rarely shrubby. They usually have divided or compound, rarely simple leaves. It is generally very easy to recognise the Umbelliferæ as Umbelliferæ, but often very difficult to tell one from another. Details of the fruit must usually be observed. The Umbelliferæ generally abound in a resinous secretion, and a volatile oil, from which many of them derive poisonous and medicinal properties, more or less common to all parts of the plant, and often highly developed in the seeds. Acridity is their general characteristic. Some are pleasantly aromatic, others have a powerful and disagreeable smell. In the roots of some, especially when enlarged by cultivation, starch and sugar are secreted, so that they become useful for food, although the peculiar flavour of the essential oil is still retained. Of esculent-rooted Umbelliferæ the carrot and parsnip are the best-known examples; skirret, earth-nut, and arracacha are also of some value. The blanched stems of celery, enlarged by cultivation, are a favourite salad. The candied stalks of eryngo were once much esteemed, and those of angelica are still used. The leaves of parsley, chervil, fennel, &c. are used for flavouring. Lovage (*Levisticum officinale*) is sometimes cultivated as a salad plant. The seeds of anise, caraway, coriander, &c. are used as carminatives. Hemlock, water hemlock, water parsnip, fool's parsley, and many others are narcotic poisons; asafœtida, galbanum, sagapenum, and opoponax are medicinal products of this family.

Umber, a brown earthy mineral used as a pigment. It is found in Italy, Cyprus, England, and other countries. Like Ochre (q.v.), umber contains a large proportion of sesquioxide of iron, but it differs from ochre in containing to the extent of about one-fifth of its weight, one of the higher oxides of manganese. The mineral is prepared for use as a pigment by grinding it to a powder, washing it with water, and then drying it at 212° F. When so treated it is known as *raw umber*, and is of a pleasing but rather pale grayish-brown hue. *Burnt umber* is prepared from raw umber by calcination, and is of a darker, richer, and more transparent brown colour. Both kinds are permanent either as water-colours or oil-colours, and burnt umber especially is much used by artists as well as by house-painters. Umber was one of the colours employed by the old masters.

Umbilical Cord. See FŒTUS.

Umbrella (Lat. *umbra*, 'a shade'). As a shade from the sun, the umbrella is of great antiquity. In the sculptures of Egypt, Nineveh, and Persepolis umbrellas are frequently figured (see fig. at ASSYRIA). In the East, however, its use seems anciently to have been confined to royalty, having the ceremonial significance of the Baldachin (q.v.) or Canopy (q.v.). In China, Burma, &c., umbrellas, especially as sun-shades, are very familiar still. In Greece and Rome umbrellas were regularly used by women, but by men only if they were content to be regarded as effeminate. The custom was probably continued in Italy from ancient times; but at the beginning of the 17th century the umbrella seems to have been little if at all known in England. In that century, however, it came into use as a sun-shade for the luxurious; and in the reign of Queen Anne it had become common in London as a screen from the rain, but only for women. Gay's *Trivia* (1716) speaks of good housewives treading through the wet 'defended by the umbrella's oily shed.' In that century it became not unusual to have a common umbrella in coffee-houses; and *Notes and Queries* (e.g. 5th series, vol. vi. pp. 202, 213) contains many allusions to parochial umbrellas, kept to protect the bare-headed clergyman at funerals. These were made of leather, and were accordingly very heavy and cumbrous. The first person of the male sex who regularly carried an umbrella in the streets of London was apparently Jonas Hanway (q.v.)—a practice he persisted in in spite of obloquy for thirty years, when his example began to be followed. Still it was long regarded as a sign of infirmity or effeminacy to use umbrellas, and those who did so suffered much unpleasant jeering in consequence. Umbrellas and parasols (the name allotted to the sun-shade, which the word umbrella properly suggests) were at first all brought from abroad, chiefly from India, Spain, and France; now the manufacture of umbrellas has reached an enormous extent in Great Britain. Cotton, oiled silk, gingham, alpaca, silk, and various mixtures of silk and wool are in use for umbrellas. The substitution of steel for whalebone frames became common about the middle of the 19th century.

Umbrella Bird, a fruit-crow of South America (Cephalopterus), so called from its radiating crest.

Umbrella Tree. See MAGNOLIA.

Umbrette. See STORK.

Umbria, an ancient and a modern division of Italy. The ancient division lay east of Etruria, and north of the country of the Sabines. It is described as extending in early times from the Tiber eastward to the Adriatic; but when the Umbrians first come into history their power had been much reduced by struggles with the Etruscans, and we find them restricted to the ridges of the Apennines, the lowland region bordering on the Adriatic from the Æsis (*Esino*) to the

Rubicon, being held by a race of Gallic invaders, known as the Senones. The Umbrians were an Aryan people closely allied with the Oscans and more remotely with the Latins. The most important memorial of their language is the so-called Eugubine Tables (q.v.). The Umbrians were subjugated along with the Etruscans, but joined the Samnites in their last gallant struggle against Rome, and were crushed at Sentinum (295 B.C.). The country was hilly but fertile and populous. In the modern division of Italy the *regione* or *compartimento* of Umbria includes the provinces of Perugia, Terni, and Rieti.

On the language there are works by Grotefend (Hannov. 1835–39), Aufrecht and Kirchhoff (Berlin, 1851); see also Saveloberg's *Umbrische Studien* (1873), Bücheler's *Umbrica* (Bonn, 1883), and Conway's *Italic Dialects* (Oxford, 1897).

Umlaut, a German word invented by Grimm, and now in general use among writers on the philology of the Teutonic tongues (including English) for a vowel change brought about on a preceding vowel by the vowel *i* (or *j*) modifying the first in the direction of *i*. The *i* or *j* which produced the change has since disappeared or changed to *e*. It is common in German (thus *Gänse*, the plural of *Gans; schlüge*, the subjunctive of *schlug*); and there are survivals in English, as *men* (from *manniz*), plural of *man; fell* (from *falljan*), causative verb from the root of *fall* (*fallan*); *mice* (*musiz*), plural of *mouse* (*mus*). Umlaut by other vowels is recognised.

Umritsir. See AMRITSAR.

Umrohah. See AMROHAH.

Unalashka. See ALEUTIAN ISLANDS.

Unamuno, MIGUEL DE, a prolific and versatile Spanish writer, born at Bilbao of Basque parentage in 1865, was appointed in 1892 professor of Greek at Salamanca University, and later made vice-rector; he was removed from both of these posts and exiled by the directory in 1924 for interference in politics. His writings include mystic philosophy, *El Sentimiento Trágico de la Vida* (1913; trans. 1921); historical studies, *Vida de D. Quijote y Sancho;* collections of essays, *Ensayos* (7 vols. 1916–19; trans. 1 vol. selection, 1925); books of travel, *Andanzas y Visiones Españolas;* criticism, *La Angonia del Cristianismo;* lyrical novels, *Niebla;* austere blank verse sonnets, *Rosario de Sonetos.* The relation of man to creation is the chief theme of his work, which reaches its most brilliant expression in the essay form.

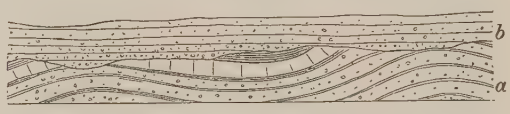
Uncial Letters. See PALÆOGRAPHY.

Unclaimed Money, and things left without an apparent owner, were assigned by the Roman jurists to the first person who took possession of them. According to feudal law land left without an owner escheated or fell back to the superior of whom it was held, and movables to which no person could make out a claim were given to the crown as *bona vacantia.* By modern rules of law facilities are given to persons claiming to be entitled to money in court or government stock; subject to any rightful claim, the money or stock is transferred to some public account. Thus, for example, the National Debt Act, 1870, provides that stock on which no dividend has been claimed for ten years shall be transferred to the National Debt Commissioners. A list of names, out of which stock has been transferred, is to be kept, and the list is open for inspection. Re-transfer is made to any claimant who can show his right, public notice being given to enable other claimants to appear. The court will not as a rule direct a re-transfer without an inquiry as to persons interested. Expense is sometimes incurred by persons who put forward claims as next of kin to owners of stock, &c., who have died intestate. In such cases it is well to remember that similarity of name, or vague evidence of relationship, is not enough to establish a title to property.

Uncleanness. See ABLUTION, TABU.

Unconditioned. See RELATIVITY OF KNOWLEDGE.

Unconformity, or UNCONFORMABILITY, in Geology, is a structure which implies an interruption in sequence. When strata occur in regular sequence—each successive bed resting regularly upon the surface of the bed subjacent to it—they are said to be conformable. But when one set of beds extends over the denuded surface of another series we have what is called *unconformity.* The structure is shown in the accompanying section, where we have a discordant junction between two sets of strata, the upper series (*b*) resting unconformably on the upturned and denuded edges of the lower series. Such an unconformity usually points to the lapse of a long period of time. In the section the lower series (*a*) must first have been deposited, and subsequently folded and subjected to much denudation, which removed the



tops of the anticlinal arches so as to expose the truncated ends of the beds. In many cases this denudation has been in great part subaërial—the rocks have formed part of a land-surface for some protracted period. Afterwards the denuded land-surface was submerged, so that newer deposits (*b*) were accumulated unconformably upon the older series. A well-marked unconformity thus usually indicates the following succession of changes: (1) a movement of elevation, followed by (2) terrestrial conditions and more or less excessive denudation; and thereafter (3) subsidence accompanied by deposition of sediment over a gradually increasing area.

Unconscious. See HARTMANN.

Unction. See EXTREME UNCTION.

Underground Railroad, a name given in the United States, before the abolition of slavery, to a secret arrangement for helping slaves to escape, by passing them along from one hiding-place to another till they reached Canada or other territory where they were safe from recapture.

Undines (Lat. *unda,* 'wave'), the name given in the fanciful system of the Paracelsists to female water-spirits. They intermarry readily with human beings, and the Undine who gives birth to a child under such a union receives with her babe a human soul. But the man who takes an Undine to wife must be careful not to go on the water with her, or at least must not vex her while there, or she returns to her native element. This notion is elaborated in Fouqué's *Undine;* see also MELUSINE, SYLPH.

Undset, SIGRID, Norwegian novelist, was born in 1882 at Kallundborg in Denmark, and was a clerkess in Christiania before establishing herself in the foremost rank of Scandinavian writers. Her chief work, one of power and insight, yet full of the grimness of her race, is a 14th-century trilogy, *Kristin Lavransdatter* (1920–22), an exhaustive study of womanhood.

Unemployment, a problem of industry characterised by the idleness of workers who are, nevertheless, able and willing to work. Until the

end of the 19th century unemployment was regarded as the outcome of special circumstances (wars, social changes, &c.), and distress, while it lasted, was relieved by the methods of the Poor-law (q.v.). But ultimately it came to be realised that a certain amount of unemployment is a regular feature of the modern industrial system, and that the cure lies not in pauperising the unemployed, but in remedying the specific defects of the system.

Investigation of the question has shown that three principal factors contribute to the existence of an unemployment problem. (1) Most groups of trades have, attached to their respective labour markets, a 'reserve of labour,' workers who remain at hand in the hope of being employed casually —one, two, three days per week—according to the fluctuating needs of trade. The demand for labour is irregular both in time and place, so that the hope of work and the desire to be 'on the spot' usually attract a somewhat excessive supply of prospective workers. Accordingly, there is a more or less regular 'margin of idleness.' Unskilled trades, such as those connected with docks and wharves, are most affected by this type of unemployment, but the reserve of labour—an 'irreducible minimum' of somewhere about 2 per cent.—is found in normal times even in skilled and organised trades, and presents a chronic problem if its earnings are insufficient to tide over the periods of idleness. (2) An extension of the same problem is seen in the susceptibility of most trades to industrial depressions, whether (*a*) *seasonal*—i.e. recurring every year at periods peculiar to the various trades; mining, for instance, has its slack season in summer, building in winter—or (*b*) *cyclical*—i.e. recurring as part of a trade cycle at more or less regular periods of years, and affecting usually all industries and countries. Some writers regard trade cycles as financial in origin, others as psychological, economic, or physical (e.g. the effect of sun-spots on the world's harvests). A part at least of the reserve required to meet the demands of busy seasons or years must in times of depression be either unemployed or under-employed. (3) Numerous particular influences act upon the rate of unemployment, though often temporarily; such are changes in industrial structure or methods, migration of industries, deficiences in industrial training, new legislation, changes in fashions, &c. In the main, however, unemployment can be attributed to 'specific imperfections of adjustment between the demand for labour and the supply of labour' (Beveridge). The cure, so far as one is possible, will lie in efforts first to regularise the demand for labour and give the supply greater mobility, thus mitigating the economic leakage arising from spasmodic and unorganised employment, and then to devise measures of relief for such unemployment as remains. The futility of charitable relief was amply proved during the 19th century, while the system of municipal 'relief works' outlined in the Local Government Board circular of 1886 and legislated for in the Unemployed Workmen Act (1905) was wasteful as well as useless. The act also set up distress committees throughout the country and made provision for employment exchanges, but was superseded by the Labour Exchanges Act (1909), which, in its establishment of a national system of exchanges, was a notable advance on previous attempts to deal with unemployment as a question apart from the Poor-law. In 1911 followed the National Insurance Act, Part II. of which dealt with unemployment insurance (see INSURANCE, p. 180) as a method of relief in seven principal industries. The new machinery was severely strained in the years of war and depression which followed, and must evidently still be regarded as in the experimental stage. In particular, it must be questioned whether the unemployment insurance system as it has developed is not over-burdening the organising work of the exchanges.

The best general statement of the problem is Sir William Beveridge's *Unemployment: A Problem of Industry* (1909). See J. A. Hobson, *The Economics of Unemployment* (1922); books by Pethick Lawrence (1922), Prof. Bowley and others (1922); and by Cohen (1921), and Morley (1924); and the important reports of the Poor-law Commission of 1909.

Ungava. See EAST MAIN.

Unguents. See OINTMENTS.

Ungulata ('hoofed'), an order of mammals, including (1) the Artiodactyla (with an even number of toes)—e.g. pig, hippopotamus, peccary, camel, chevrotain, and ruminants like cattle, sheep, and deer; (2) the Perissodactyla (with an odd number of toes)—e.g. tapir, rhinoceros, and horse. Many zoologists include (3) the Hyracoidea—e.g. Hyrax (q.v.); and (4) the Proboscidea or Elephants (q.v.). See ARTIODACTYLA.

Ungvár, Magyar name of Užhorod (q.v.).

Uniats. See GREEK CHURCH.

Unicorn (Lat. *unum cornu*, 'one horn'), a fabulous animal, mentioned by ancient Greek and Roman authors as a native of India, its body resembling that of a horse, exceeding swift, and having one straight horn a cubit and a half long on the forehead. Aristotle makes the oryx (an antelope) and the Indian ass one-horned. Although the descriptions of the unicorn given by the ancients are very unlike the Indian rhinoceros, yet probably that animal was the origin of them all. The word unicorn was unhappily used in translations of the Old Testament for the Hebrew *rĕĕm*. The Septuagint led the way in this, by using the Greek *monokerōs;* and it has been supposed by many that the animal meant is a rhinoceros. But from Deut. xxxiii. 17, where the Authorised Version has 'horns of unicorns,' the revised translation has 'horns of the wild ox.' Elsewhere the alternative 'ox-antelope' is given in the margin of the new version. The spirally twisted unicorn's horn of heraldry is probably derived from the 'horn' of the Sea-unicorn or Narwhal (q.v.).

See BESTIARY; HERALDRY; G. R. Brown, *The Unicorn* (1881); C. Gould, *Mythical Monsters* (1886).

Uniform ('one shape') is the distinguishing dress of any special body of individuals—whether soldiers, sailors, or members of a society or club. *Military uniforms* in Great Britain may be said to date from the Restoration, and the consequent formation of a standing army. As early as Henry VIII.'s time the sovereign's bodyguard (now the Honourable Corps of Gentlemen-at-Arms in England and the Royal Archers in Scotland) received a distinctive dress. But this dress was several times changed—e.g. cloth of gold and silver became red and yellow damask in 1529, and then white and black shortly afterwards. The life guards and horse guards, formed in 1661 from the troops which had fought on opposite sides during the Great Rebellion, in buff coats, cuirasses, and steel caps, were then dressed in scarlet coats, feathered hats, and jack boots. Cocked hats were soon after given them, and in 1812 helmets. Somewhat similar changes have taken place in the rest of the army. Military uniform consists of a coat of one prevailing colour, variously ornamented and 'faced' according to rank and corps, a special head-dress and trousers or kilt. Scarlet was long the national uniform of the British army in peace, blue of the German and French. But this only applies to the tunic or jacket, and there were many exceptions. Thus British artillery and many cavalry regiments wore blue, all rifle regiments green, some regiments of

the Indian army yellow, drab, and French gray, some colonial and other volunteers gray. In hot climates, during summer, only white uniform is worn, and the white helmet is universal for European troops. The kilted dress of the Highlanders is peculiar to the British and Canadian armies. Blue was the uniform of the United States army. The head-dress is a very distinctive part of the uniform. At home the Scots Greys and foot-guards wear bearskins, and all fusiliers hats of similar shape; hussars and horse artillery wear Busbies (q.v.), kilted regiments the feather bonnet, Highland Light Infantry the shako, rifle regiments now a small astrakhan busby, staff-officers cocked hats. All others wear helmets, metal for cavalry, blue cloth for other arms; Indian regiments generally turbans. Facings, formerly very prominent, are now confined to collars, cuffs, and the busby bags of hussar regiments. The rule is blue for royal regiments wearing scarlet, and *vice versâ*. The colours of the plumes too are very numerous—black, white, red, and a mixture of two of these colours, yellow or green. In the Great War the chief belligerents clothed each its own army in the same uniform for all branches, with slight badges of identification. Thus the British Empire troops wore *khaki* (Hindustani, 'dust'), Germany used the '*field-gray*,' France '*horizon blue*,' the United States *khaki*. The idea was inconspicuousness. It is possible this system may persist universally, but in countries dependent on voluntary enlistment it is likely that more ornate uniforms may return for the attraction of recruits. Officers of all arms wear, in addition to other marks, badges of rank on their shoulder-straps. One star denotes a second-lieutenant, two a lieutenant, three a captain, a crown a major, a star and crown a lieutenant-colonel, a second star a colonel. Cross-swords added to these signify the various grades of general officer, and cross-batons a field-marshal. In the United States army the shoulder-straps of a second-lieutenant are plain, those of a first-lieutenant bear a silver bar at each end, those of a captain two silver bars at each end, those of a major a gold oak-leaf at each end (silver for a lieutenant-colonel); a colonel's shoulder-straps bear a silver eagle, a brigadier's a silver star, a major-general's two and a lieutenant-general's three silver stars, and the general's two silver stars with a gold eagle and device between. The Confederate uniform was gray.

Uniforms in the British navy were not laid down until the reign of George III. Like other nations, the prevailing colour is blue. Tail coats and epaulettes, discarded by the army after the Crimean war, are still worn by officers in full dress, and cocked hats. Rings of gold lace and badges on the epaulettes denote the rank (see EPAULETTE). Flag officers and commodores, 1st class, have a broad band of lace round the sleeve, with rows of narrow lace above it—four rows for admirals of the fleet, three for admirals, two for vice-admirals, one for rear-admirals and commodores, 1st class; commodore, 2d class, has the broad band with a small circle of narrow lace above it on the front of the sleeve. Ranks junior to these have no broad band below, but have rows of narrow lace alone—captains, four rows; commanders, three; lieutenants of over eight years, two, with a narrower strip of lace between them; lieutenants of under eight years, two; sub-lieutenants, chief gunners, and chief boatswains, one. The engineer, medical, and civil branches have the same number of rows of lace as officers of the corresponding ranks of the executive branch, but have coloured cloth between the rows—engineer, purple; medical, scarlet; naval instructor, light blue; accountant, white. In the United States navy dark navy-blue is the uniform colour, but in warm weather a service coat of white linen duck trimmed with white braid is substituted, and a white cork helmet may take the place of the cocked hat or service cap.

Since the beginning of the 19th century, with its development of field-sports and travelling, it has become usual for British officers not to wear their uniforms when off duty, save on special occasions. In 1815 officers sitting in parliament wore their uniforms; and twenty or thirty years later officers when on leave wore a frogged coat—a spurious kind of undress of their own invention. The *privilege* of wearing plain clothes, now granted also to warrant officers, to a great extent rests with the general in command, and might at any time be withdrawn.

Uniformitarian. See GEOLOGY, p. 152.

Uniformity, ACT OF, a measure passed in 1662, by which a number of clergymen, variously stated at from 800 to 2000, were driven out of the English national church. There was an earlier Act of Uniformity in 1559. See ENGLAND (CHURCH OF), INDEPENDENTS, NONCONFORMISTS, and works cited under the first two articles.

Unigenitus. See JANSEN, GALLICAN CHURCH.

Unio. See UNIONIDÆ, MUSSEL, PEARL.

Union. The crowns of England and Scotland were united under one sovereign on the accession of James VI. of Scotla ' ' to the English throne as James I. in 1603; but for above a century longer each country continued to be ruled by its respective parliament, the interest of the one often coming into collision with that of the other. After various fruitless proposals for a closer connection of the countries, the Scots were in 1702 prevailed on to send twenty commissioners to London, who, with twenty-three English commissioners, should deliberate on the terms of union. Their proceedings, after being broken off, were resumed in 1706. The union, though popular in England, was the subject of great dissatisfaction in Scotland, being regarded by the bulk of the community as a surrender of national independence to a powerful rival. The treaty was, however, after strenuous opposition, ratified by the Scottish as well as the English parliament, and ultimately completed on May 1, 1707. Its principal condition was the incorporation of England and Scotland into the United Kingdom of Great Britain, the succession of whose monarchs was to be the same as that of England. There was to be one parliament, in which the peers of Scotland would be represented by sixteen of their number elected each parliament, and forty-five Scottish members were to sit in the House of Commons (see PARLIAMENT, NOBILITY). All rights and privileges were to be common between the subjects of both kingdoms, unless when otherwise agreed. The Episcopal Church was confirmed in England, and the Presbyterian in Scotland. Scotland was to retain her Courts of Session and Justiciary, and to have a separate seal for private rights and grants. While the parliament was to raise £2,000,000 by land-tax, Scotland would contribute £48,000 of that sum. The laws of trade, customs, and excise in Scotland were to be assimilated to those of England, and the coinage, weights, and measures of the two countries were to follow a uniform standard. In other matters the laws of Scotland were to remain in force, but might be altered by the parliament of Great Britain. The separate Privy Council of Scotland, which the Act of Union left untouched, was abolished the following year. See SCOTLAND, and books cited there; also FLAG.

Ireland remained a distinct kingdom till 1801, when it was united with Great Britain into the United Kingdom of Great Britain and Ireland.

By the terms of the union the separate parliament of Ireland was done away with, and Ireland was represented in the parliament of the United Kingdom by four lords spiritual and twenty-eight lords temporal in the House of Lords, and 100 members of the House of Commons. For the arrangements as to Irish peers, see NOBILITY. The churches of England and Ireland were united into one Protestant Episcopal Church (see under IRELAND the section IRISH CHURCH). The subjects of Ireland were placed on the same footing as those of Great Britain in respect of trade and navigation, and in all treaties with foreign powers; and the law-courts of Ireland were to continue, subject to the regulations of parliament, writs of error and appeals being decided by the House of Lords of the United Kingdom. For the disestablishment of the Protestant Episcopal Church in Ireland, see IRELAND (*Irish Church*). For the movement for repeal of the union, and its partial success in 1921 when the withdrawal of the Irish Free State was agreed upon, leaving only Northern Ireland within the United Kingdom, see IRELAND (*History*), also ULSTER, GRATTAN, O'CONNELL, PITT, PARNELL, and works there cited.

Union. See POOR-LAW; UNIONS AND FEDERATIONS; and for the Union of South Africa, see SOUTH AFRICA.

Union, a town of New Jersey, on the Hudson, opposite New York, with manufactures of silk, chemicals, &c.; pop. (1920) 20,651.

Unión, LA, a mining town of Murcia, Spain, 5 miles E. of Cartagena; pop. (1920) 24,837.

Union College, situated at Schenectady, New York, was incorporated in 1795, and rose to prosperity under the long presidency of Rev. Eliphalet Nott, from 1804 to 1861. It has some admirable buildings. In 1873 a new charter enabled certain schools of law, medicine, and pharmacy at Albany to unite with the college to form Union University.

Unionidæ, a family of lamellibranchiate molluscs, whose metropolis appears to be in the western hemisphere, represented in Britain by two genera, Unio and Anodonta. The shell is regular, equivalve, and closed, the ligament external. In Unio the hinge is furnished with teeth. Pearls of a large size and considerable value are often found in *U. margaritifera*. At Perth an extensive fishery flourished in the river Tay until the end of the 18th century, and from 1761 to 1764 produced pearls to the value of £10,000.

Union Islands. See TOKELAU.

Unionist, a name applied to various political parties (e.g. in South Africa), but especially from 1886 to the opponents of Irish Home Rule. The Liberal Unionists who then separated themselves from the Liberal party gradually merged in the Conservatives.

Union Jack. See FLAG.

Unit. See UNITS.

Unitarians, a name applied generally to all who maintain the doctrine that God exists in one Person only, as opposed to the doctrine of a Trinity of Persons of co-equal Deity in the Godhead. In this general and indeed abstract sense the name of course includes Jews and Mohammedans. This article, however, is limited to a brief account of Unitarianism as a movement of thought within Christendom. Historically the real centre of the controversy between 'Trinitarians' and 'Anti-trinitarians' has always been the doctrine of the Personality of Christ and the relation of Christ to absolute Deity on the one hand and to Mankind on the other. From the middle of the 2d century to the end of the 3d century there was a succession of eminent Christian teachers—Monarchians—who maintained, against the ecclesiastical doctrine of the Logos, the undivided unity of God. There are said to have been two classes of them—those who taught that Christ was God in such a sense that it was the Father who became man (see PATRIPASSIANS, SABELLIANISM), and those who held that Christ was in nature a mere man, but exalted above all other prophets by the superior measure of Divine wisdom with which he was endowed. The latter class was represented by Theodotus, Artemon, and especially Paul (q.v.) of Samosata. The grand theological struggle which followed in the 4th century between the Arians and the Athanasians may be regarded as but another phase of the Unitarian controversy (see ARIUS, ATHANASIUS).

It is not strange that in the great stir of thought which accompanied the Reformation some should have been found bold enough to question the Catholic doctrine of the Trinity; such there were even before the Socini (see SOCINUS), such as Bassen, Denck, Campanus, and Servetus (q.v.). So widely, indeed, was the Unitarian doctrine diffused that it was thought necessary, in the first article of the Augsburg Confession, to condemn the modern Samosatans, who deny the personality of the Word and Spirit; and in 1527 Althamer published a work against 'the modern Jews and Arians under a Christian name, who deny the deity of Christ.' Under the influence of the elder Socinus Unitarianism gained many adherents in Venetia; but Poland and Transylvania became its principal strongholds. In Poland the nobility, protected by their class privileges, proved favourable; the Unitarian refugees from other countries found here a ready welcome; and in the reign of Sigismund II. (1548–72) this party of reformers was strong enough to form itself into a separate church. Later Poland was the principal field of labour of the younger Socinus, and Unitarianism continued to flourish there till the middle of the 17th century, when, under John Casimir, it was extirpated by force. In Transylvania the Unitarians have succeeded in maintaining their existence, notwithstanding much opposition and persecution, from the Reformation to the present day. Led by George Blandrata (q.v.) and Francis Dávid (1565), large numbers, including the king himself, embraced the new opinions. But in 1572 the Unitarians were forbidden to make any attempts at propagandism, or even to print their religious books; after the incorporation of Transylvania with the Austrian empire (1690) they were robbed by the Roman Catholics of all their churches and church property, forbidden to build new churches without the permission of the emperor, and excluded from all government offices. On the accession of Joseph II. happier times returned. It was forbidden to seize their churches, and an indemnity was even paid them for the loss of their cathedral church of Klausenburg (Kolozsvár, now Cluj). The Unitarians of Transylvania number above 75,000. They have an organised system of church government, with a bishop at its head. They have three colleges—that of Cluj (Kolozsvár), where the work is devoted specially to the teaching of doctrinal and practical theology; that of Torda; and that of Szekely-Keresztur. The Francis Dávid Association, which was established in 1884, for the promotion of religion and moral culture, had in 1914 eleven branches and upwards of 1900 members. Catholics and Jews, as well as orthodox Protestants, gladly attend the meetings of this association, and read papers on social, religious, and educational subjects. In many of the Reformed and Lutheran Churches of Transylvania there is a growing tendency toward liberal opinions in religion, and Unitarian litera-

ture is most welcome among the cultivated members of those churches. The future of the Unitarian and other minority churches in Transylvania is full of difficulty and perplexity, owing to the transfer of the province to Rumania under the Treaty of Trianon (1920). The situation has been closely watched in England and the United States in the interests of religious liberty and the rights of minorities guaranteed by the Peace Treaty. In this work Unitarians have taken a leading part.

In England, as early as 1548, a priest named John Ashton was accused of Arianism, and escaped with his life only by recantation; and during the reigns of Edward VI., Mary, Elizabeth, and James I. a few suffered martyrdom on similar charges. In the reign of James I. continental Socinianism began to exercise considerable influence in England, and in 1665 Dr Owen wrote that 'the evil is at the door, that there is not a city, a town, scarce a village in England, wherein some of this poison is not poured forth.' But it was in the last decade of the 17th century that the controversy on this subject was most active, and at this time were published the anonymous 'Unitarian tracts.' Hitherto the Unitarians, with the exception of the society formed in London by John Biddle (q.v.), which did not survive its founder, had no organised existence. The first to use the term Unitarians (*c.* 1687) was the heretical mercer and philanthropist, Thomas Firmin (1632–97), a friend of Biddle's. The first preacher who described himself as Unitarian (*c.* 1704) was apparently Thomas Emlyn (1663–1741), a Presbyterian who was imprisoned and fined on the charge of blasphemy. After the passing of the Toleration Act in 1689 the way was prepared for that gradual change by which the orthodoxy of the English Presbyterians passed into Unitarianism. It was at this time that most of the old Presbyterian chapels were founded; and the trusts being 'open,' ministers and people were left free to adopt whatever new opinions should approve themselves to their conscience. Thus the Unitarians may be said to be the successors of the 2000 Presbyterian divines who in 1662 left the Church of England in consequence of their inability to comply conscientiously with the terms of the Act of Uniformity. The English Presbyterians were originally as orthodox as their Episcopal brethren; but having refused to commit themselves to any authoritative creed, while some continued orthodox, others underwent a gradual change to Arian, and at length to Unitarian, views. Many preached such views without exciting attention or controversy, although, until 1813, the law which made it Blasphemy (q.v.) to speak against the Trinity was still in existence. During the later half of the 18th century Dr Priestley (q.v.) appeared as the champion of the humanitarian view of Christ's nature, and by the influence of his writings secured the more open advocacy of that doctrine. In 1773 Dr Lindsey resigned his charge in the Church of England, and became pastor of the Unitarian congregation of Essex Street, London. In 1813 the Unitarians were placed by law fully on a par with other dissenters. The Unitarians of England and Wales are purely congregational in their church government, their principal organs for combined action being the British and Foreign Unitarian Association, whose headquarters are at Essex Hall, London, and the National Conference of Unitarian, Free Christian, and kindred churches. They have three colleges—Manchester College, Oxford; the Unitarian College, Manchester; and the Presbyterian College, Carmarthen. All of these adhere to the principle of freely imparting theological knowledge (including preparation for the work of the ministry) without insisting on the adoption of particular theological doctrines.

Towards the close of the 18th century there was a certain amount of Arianism among the Moderates in the Church of Scotland. Unitarianism, as a distinct system, was preached at Montrose as early as 1783; and at the beginning of the 19th century some attempts were made to diffuse it by means of missionary efforts. There are now nine congregations in Scotland. That at Edinburgh was originally a branch from the Cameronians (q.v.), but, having adopted the principle of free inquiry, its members gradually embraced Arian, and eventually (1812) humanitarian, views.

In Ireland the history of Unitarianism is intimately connected with that of Presbyterianism. It flourishes principally in the north of the island, and the Irish Unitarians are Presbyterians in fact as well as in name.

After 1740 Arian views of the person of Christ were pretty widely diffused among the New England clergy; and in 1787 took place the first secession from the Episcopal Church. By imperceptible degrees many of the New England churches glided into Unitarianism; but it was not until about 1815 that the name began to be much used. At that time the influence of Dr Channing (q.v.) was thrown into the scale; and since then Massachusetts, and particularly Boston, has been the stronghold of Unitarianism in America. The Unitarians have about 400 societies in the United States, and upwards of twenty-five in Boston alone. Harvard University, Cambridge, is not a denominational institution; but it is at present in the hands of the Unitarians, and most of their ministers are educated either there or at the Meadville Theological School, Pa. Besides the Unitarians, properly so called, the Universalists and the Hicksite Quakers are understood to hold anti-Trinitarian sentiments, though they give no special prominence to the doctrine of Divine Unity. There are a few Unitarian churches in the principal colonies of Great Britain; and Unitarian sentiments, under the names of Liberal Christianity and Rationalism, are more or less widely diffused in France, Switzerland, Germany, and Holland.

The early Socinians assumed, as the fundamental principle of their theology, the sufficiency of Scripture, or rather of the New Testament, which, they held, had superseded the Old. Christ was a true man, but conceived of the Holy Spirit; and on account of the divine power which he has received from the Father, and his exaltation as head over all things, he is to have worship offered to him. The Holy Spirit is not a Person, but a Divine influence. Man was created with a mortal nature, but, by the special gift of God, was endowed with a conditional immortality. The gift of immortality he forfeited by disobedience. The fall of Adam, being a single act, could not deprave his own nature, much less that of his posterity; and in the latter death was not a consequence of the fall. Thus the actual consequence of Adam's fall was not any radical corruption of human nature, but rather a moral deterioration. Man, after the fall, retained his free will, and the power of abstaining from sin if he so pleased. Christ's merits did not consist principally in his death, but in his life, his teachings, and his example. Nor was his death regarded as an atoning sacrifice, or as having any vicarious efficacy whatever, but simply as a confirmation of God's will, and the seal of the new covenant. Not Christ's death, but his resurrection, is the central point of the Christian scheme. By this he confirmed his doctrine of immortality, and prepared for his ascension into heaven, where he now fills the office of our great High Priest. Predestination in this system means the decree of God,

made before the foundation of the world, that they who believed and were obedient should be saved, and that they who believed not and were disobedient should be damned. Justification takes place when God pardons our sins and gives us eternal life. The Socinians regarded the sacraments as simply external signs testifying to Christian faith. Hence they held infant baptism to be irrational as well as unscriptural, but thought that a custom so old and established should be tolerated.

With the early Socinians the English Unitarians have no very direct historical connection. They seem rather to have arrived at independent conclusions through their 'rational' interpretation of Scripture, and their consistent rejection of human authority in matters of faith. The Unitarians of the present day, though not, perhaps, increasing appreciably in denominational strength, claim with considerable justice to have exercised, and still to exercise, an influence on religious thought out of proportion to their numbers. True to the principle of the 'Open Trust,' they have steadily refused to allow themselves to be bound by any authoritative creed, or even by the letter of Scripture, where it is found to be in conflict with the dictates of reason and conscience. Hence they view the encroachments of science on the domain of theology without dismay, and the advance of Biblical criticism with sympathy and approval. No mistake could be greater than to assume that the Unitarianism of to-day is identical with that of Socinus, of Priestley, or even of Channing. The Unitarian controversy of the early and mid-Victorian period, which turned mainly on the proper interpretation of Scripture texts, may now be considered altogether obsolete. Under the guidance of James Martineau and his disciples and successors, the Unitarians of the present day have abandoned the philosophy of Locke and Priestley for more spiritual modes of thought. So far from regarding man as entirely dependent upon his reasoning powers for his knowledge of religion, they rather look upon him as standing in a living relationship with the one infinite source of all truth, and as having within his own nature the germs of the highest religious faith. Christianity, accordingly, they regard not as a *message* or a system of truth communicated and authenticated from without, but as the highest expression of the Divine in humanity—an expression not necessarily preternatural, but connected with the previous history of mankind by the natural laws of moral and spiritual development. To this view of Christianity the miracles are not felt to be essential as proofs; and the truths of the gospel are thought to be quite unaffected by any judgment regarding them From this point of view Unitarianism as now generally professed may be defined, not as 'a miraculously confirmed Deism,' but simply as Christian Theism—i.e. Theism in accordance with the spirit and teachings of Jesus Christ as presented in the four Gospels. Hence the emphasis laid by Unitarian teachers on the two great commandments of love to God and love to one's neighbour, declared by Christ to be the sum of true religion. In short, the Fatherhood of God and the Brotherhood of man are the two great affirmations of the Unitarian faith; to which, however, must be added the Leadership of Jesus Christ as our great Teacher and Exemplar, and the Immortality of man.

It will of course be understood that where there is no doctrinal standard there must be many shades of opinion, but all Unitarians are agreed in rejecting the entire orthodox scheme—including the doctrines of the Trinity, the vicarious atonement, the deity of Christ, original sin, and everlasting punishment—as both unscriptural and irrational. The ceremony of the Lord's Supper is still celebrated in many of their places of worship—not of course as a sacrament, but in commemoration of Christ's life and death—but in many others has fallen into desuetude. Some object to the name Unitarian as one which might be held to imply a doctrinal bond of union, and so be inconsistent with unrestricted freedom of religious thought: but this claim for freedom is regarded simply as a fundamental factor in the spirit and principles of the religious tradition which has been described above.

The classics of modern Unitarian Christianity are the writings of William Ellery Channing, Theodore Parker, and (especially) James Martineau. Full information as to the position of the Unitarian movement at the present time will be found in J. Estlin Carpenter, *James Martineau: Theologian and Teacher* (London, 1900); Earl Morse Wilbur, *Our Unitarian Heritage* (Boston, U.S.A., and London, 1925); S. H. Mellone, *Liberty and Religion* (London, 1925), a centenary history of the British and Foreign Unitarian Association; J. E. Carpenter and others, *Freedom and Truth: Modern Views of Unitarian Christianity* (London, 1925), eight essays by representative English and American Unitarian writers. Among smaller works the following are noteworthy: Alexander Gordon, *Heads of English Unitarian History* (London, 1895) and *Heresy: its Ancient Wrongs and Modern Rights in these Kingdoms* (London, 1913); William George Tarrant, *Story and Significance of the Unitarian Movement* (London, 1910); and Carpenter, *Unitarianism* (London, 1921), a clear and concise summary of the history of the movement.

United Free Church of Scotland, a body formed by the union of the Free Church (q.v.) and the United Presbyterian Church (q.v.) in 1900. After an appeal and legal proceedings, it was decided by the House of Lords in 1904 that by the union the establishment principle, fundamental to the Free Church, had been violated, so that the property had been forfeited to the dissenting minority of the Free Church which had declined to enter the union. The Free Church section of the United Free Church being dispossessed of its property (manses, colleges, &c.), severe hardship among the clergy was caused and parliamentary intervention was invoked. A Royal Commission (1905) recommended the appointment of an executive commission to hold the property in question and allocate it as seemed reasonable. In 1906 the Assembly Hall, New College buildings, and the High Church were allocated to the United Free Church, suitable provision being made for the Free Church. A union of the United Free Church with the Church of Scotland was projected in 1907, and the question has been seriously revived more recently. To facilitate a junction the Church of Scotland promoted an act (1921) revising the position of church and state, and another (1925) concerning property and endowments. See SCOTLAND (*Church History*).

United Presbyterian Church, a religious body in Scotland, constituted in 1847 by the amalgamation of the 'Secession' and 'Relief' Churches, as described in the church history of Scotland (Vol. IX. p. 182). The dissatisfaction felt by the stricter Presbyterians with the Revolution Settlement is described at CAMERONIANS. The Marrow Controversy (q.v.) contributed to increase the discontent with the church; but the immediate cause of the formation of the Secession Church was the restoration in 1712 of the obnoxious Law of Patronage (for which see FREE CHURCH). Violent settlements, effected by the agency of dragoons, now became frequent, and greatly irritated the people; and finally, in 1730, the Assembly enacted that in future no reasons of dissent 'against the determinations of church judicatures' should be entered on record. This attempt to gag the mouths of congregations was more than some

could bear, and in October 1732 the Rev. Ebenezer Erskine of Stirling, in a sermon delivered before the synod of Stirling and Perth, denounced the recent legislation and spirit of the church. A committee appointed to consider the matter reported at the ensuing meeting of synod; and Erskine, after three days' 'warm reasonings,' was found deserving of censure. He immediately protested (as did also twelve other ministers and two elders), and appealed to the next General Assembly, which sustained the decision of the synod. Erskine left with the Assembly a written protest, which was also signed by William Wilson, minister of Perth; Alexander Moncrieff, minister of Abernethy; and James Fisher, minister of Kinclaven. The Assembly ordained that the four brethren should appear before the Commission in August and retract their protest, on pain of being suspended from their ministry. This they refused to do, and in consequence were declared 'no longer ministers of the church' (November 1733); whereupon they handed in a final written protest, in which they declared that they were obliged to make a secession from them, and appealed to the first free, faithful, and reforming General Assembly of the Church of Scotland.

At first composed of only four ministers, the 'Secession Church' rapidly began to gather strength. Little Christian societies were everywhere formed, which were gradually supplied with pastors either from the Establishment or from youths trained to the work of the ministry by Erskine and his friends. The 'four brethren' drew up a testimony declaring their reasons for separation. What they sought was the vindication of what they held to be evangelical truth, much more than of the mere right of popular election. So much popular indignation was excited by their deposition that it was thought desirable by the majority of the Moderate party to make certain concessions to the Evangelicals, or Marrow party. The General Assembly of 1734 passed some measures distinctly favourable to the latter party, and empowered the synod of Perth and Stirling to remove the censures from the four brethren, and to restore them to their respective charges; but Erskine declined to be 'reponed.' In December 1736 appeared the pamphlet commonly known as the Judicial Testimony, which is a sort of survey of the whole ecclesiastical history of Scotland from the Reformation downwards. In 1737 four other ministers joined the original four. In 1738 the commission of Assembly libelled the 'eight brethren,' and summoned them to appear before the Assembly of 1739, which they did; and after a year of grace the General Assembly of 1740 solemnly pronounced their deposition, and the connection between Erskine and the church of his fathers was for ever at an end.

In 1747 a rupture or 'breach' took place in the new body on the question of the burgess-oath, some affirming that this oath could not be taken by any consistent Seceder, and others insisting that it could, and that the question regarding it ought to be matter of mutual forbearance. The party condemning the religious clause in the burgess-oath formed the *General Associate Synod*, or, popularly, the *Anti-burgher Synod;* the party tolerating it, the *Associate* or *Burgher Synod*. Subsequently a second split occurred in each of these in regard to the province of the civil magistrate, and two other minor denominations were formed, the one assuming the designation of the *Constitutional Associate Presbytery*, or *Old Light Anti-burghers* (1806), and the other that of the *Original Burgher Presbytery*, or *Old Light Burghers* (1799). After holding aloof from each other for more than seventy years, the Burghers and Anti-burghers began to approximate once more, and finally, in 1820, the 'New Light' sections were solemnly reunited. The Old Light sections, amongst whom Dr M'Crie was the most notable man, united in 1842 as the 'Original Seceders,' of which, after union of part with the Free Church, a remnant still forms a separate but small communion. At the date of the 'breach' the number of Secession congregations was 32; when the reunion took place it had increased to 262. Henceforward the history of the Secession Church exhibits a course of uninterrupted prosperity. Ere long the Seceders came under the liberalising influences of the new-born enthusiasm for foreign missions, and started stations in Canada, Jamaica, Trinidad, Calabar, and elsewhere; and in 1847 the Secession maintained more than sixty missionaries. Further, the Secession Church began to assume an attitude more distinctly antagonistic to the Establishment. Though it has never formally avowed the *voluntary* principle (see VOLUNTARYISM, STATE RELIGION), yet the fact that it has maintained itself *ab initio* by voluntary effort has had the effect of determining the great majority of the pastors and people to adopt this principle. The 'Voluntary Controversy' (1829-34) between leading divines of the Establishment and of the Secession served to strengthen the voluntaryism of the Seceders, and brought them more closely into connection with the Relief Church, whose theoretical voluntaryism was perhaps still more pronounced. In the 'Atonement Controversy' both bodies adhered to the liberal evangelical theology of the Marrow. But the Rev. James Morison, for what were thought his extreme views, was separated from the United Secession Church in 1841, and founded the Evangelical Union (q.v.). The desire for union between the two denominations now became stronger than ever. Committees were appointed, and conferences held; and at length, on the 13th May 1847, in Tanfield Hall, Edinburgh, the union of the Secession and Relief was formally accomplished, and the two churches formed themselves into one body under the designation of the United Presbyterian Church.

After the expulsion of Erskine and his friends from the Church of Scotland the assemblies became more determinedly 'moderate' than ever. Never were forced settlements more frequent than about this period; but *relief* was felt to be a necessity, and relief came in the person of the Rev. Thomas Gillespie, minister of the parish of Carnock, near Dunfermline. In 1749 a presentation by the patron to the parish of Inverkeithing proved so extremely unpopular that the presbytery of Dunfermline refused to proceed with it. After various intermediate steps the Assembly of May 1752 ordered the presbytery to induct the presentee on Thursday the 21st. The presbytery did *not* meet on Thursday—at least a quorum did not; and on Friday six ministers of the presbytery, including Gillespie, handed in a 'representation,' explaining why they could not obey the commands of the supreme court. They were warned by the moderator, and informed that if they remained obdurate *one* of them should be deposed. Gillespie was ultimately fixed on as the most suitable sacrifice, and without libel or any formal process whatever, he was arraigned, condemned, and deposed. Out of 158 members present, only 56 voted.

The *Relief Church*, it will thus be seen, was founded simply on an assertion of the right of congregations to elect their own ministers. In 1758 Thomas Boston, minister of Jedburgh, son of the great Boston (q.v.), threw in his lot with Gillespie; in 1761 the congregation of Colinsburgh, in Fife, did the same. The Relief had now got a

footing, and steadily increased. At the union in 1847 they numbered 113 congregations, while the Secession numbered 384 congregations; so that the United Presbyterian Church commenced with some 500 churches, and a membership estimated at more than 140,000.

The career of the United Presbyterian Church as a corporate body was one of uninterrupted prosperity. In point of doctrine it adhered (like all the other Presbyterian churches of Scotland) to the Westminster Confession of Faith, and the Larger and Shorter Catechisms. But in 1879 a Declaration Act was adopted, setting forth more clearly and fully the view which the Synod took of the teaching of Holy Scripture in reference to redemption, the divine decrees, man's depravity, salvation, the civil magistrate, the maintenance of the church, and liberty of opinion. Its form of church government was Presbyterian; but, unlike the Established and Free Churches, it had no intermediate courts between presbyteries and the supreme court, the Synod, really an assembly of the whole clergy, with one elder from each kirk-session. Negotiations for union between the United Presbyterian and Free Churches (see FREE CHURCH) failed in 1863–73, but were reopened in 1897, and finally resulted in union in 1900 (see UNITED FREE CHURCH). In 1875 about 100 congregations situated in England were transferred to the 'Presbyterian Church in England.' In 1900 the church in Scotland had 594 congregations and 199,100 members.

See works cited at SCOTLAND (*Church History*), ERSKINE (EBENEZER and RALPH), the work on the history of the Secession and of the Relief Churches by A. Thomson and G. Struthers (1848), and the *Lives of the Fathers of the United Presbyterian Church* (1849); the Rev. W. Mackelvie's *Annals of the United Presbyterian Church* (1873), and the short *Handbook* of the history and principles by the Rev. Dr Blair (2d ed. 1889).

United Provinces. See HOLLAND, INDIA, AGRA, OUDH.

United States of America, the largest and most important republic of the world, embracing nearly one-half of the area of the North American continent, and about three-fourths of its inhabitants. Its area is more than three-fourths that of all Europe: including Alaska, it is almost equal to it; but its population is about one-third of that of Europe.

GEOGRAPHY, PHYSICAL AND POLITICAL.

The United States consists of two detached portions of the continent of North America and the islands which are adjacent to these sections, also the territory of Hawaii, and several dependencies. These territories and dependencies are for convenience considered separately, and the reader may be referred to the articles on them. The United States proper occupies the central part of the continent, extending from the Atlantic to the Pacific Ocean, and from the Great Lakes to the Gulf of Mexico. By natural and arbitrary boundaries it is separated from the Dominion of Canada on the north, and from Mexico on the south. It lies between the parallels 24° 30′ and 49° N. lat., and between the meridians 67° and 124° W. long. Its greatest length from east to west is about 2700 miles, and its greatest width from north to south about 1600 miles. Its total area is somewhat more than 3,500,000 sq. m. As compared with Europe, for example, the coast of the United States is relatively unbroken, and has few indenting bays or projecting peninsulas. The great indenting sea known as the Gulf of Mexico is of special climatic and commercial importance, but it is as much a geographical feature of Mexico as of the United States. On the coast of the New England states there are many indentations which, though small, furnish commodious harbours. Long Island Sound adds to the commercial importance of the harbour of New York, and farther south are Delaware and Chesapeake bays, Albemarle and Pamlico sounds, and several small indentations such as those which form the harbours of Charleston and Savannah. On the Pacific border, with the exception of Puget Sound, the Bay of San Francisco, and the harbour of San Diego, there is scarcely a noticeable break in the continuity of the coast-line. There are many small rocky islands along the coast of Maine, and on the southern New England coast is a group of islands to which belongs Long Island, the largest of the islands of the United States. Farther south, off the Atlantic coast, and also in portions of the Gulf of Mexico, are many low sand-spits lying parallel to the coast and having behind them shallow channels, lagoons, and swamps. On the Pacific coast there are no islands of importance except the Santa Barbara group off the southern coast of California.

The two great mountain-systems of North America, one along the western, the other near the eastern border, attain their fullest development in the United States, and form the framework or skeleton of its physical structure. The Appalachian system, in the east, though of secondary geographical importance, is the older of the two highland regions, and of primary interest when considered with reference to the history and development of the nation. It enters the country in the northern part of New England (in Maine without the appearance of regular ranges) and New York, and extends south-westward to Alabama and Georgia, being divided by the valley of the Hudson River and Lake Champlain, and that of the Mohawk River, into three distinct sections. The system is described in detail at APPALACHIANS. A coast-plain extends from its eastern base to the sea. It is narrow in Maine, where it terminates in a bold rocky coast indented by bays, and broken into projecting promontories and islands. South of Massachusetts Bay the coast becomes lower and more sandy, and the plain grows gradually wider, with the exception of a narrow belt at New York, until in North Carolina it attains a width of 200 miles. In the southern part of New England it is characterised by hills, and below New York by a distinct coast region and a more elevated slope. This higher region, which in Virginia and thence southward is marked by a somewhat abrupt terrace, varies in altitude from a few hundred to more than a thousand feet, and is known as the 'Piedmont Plateau.' The lower coast region is seldom more than 100 feet above the sea. It has a sandy soil, and in many places there are large swamps near the coast. Much of this swampy country is uninhabitable, but when reclaimed, as it has been in many parts of North and South Carolina, it makes valuable rice-land. Many acres of fertile agricultural land have also been secured in Florida by draining its swamps. The middle elevated region is diversified by hills and valleys, and has a productive soil. The dividing line between it and the low coast-plain marks the head of navigation of most of the streams, and also determines the sites of many important towns.

West of the Appalachian system and lying between it and the western highland is the Central Valley, forming part of the great continental depression which extends from the Arctic Ocean to the Gulf of Mexico. It is almost an absolute plain, rising gradually from the Gulf toward the chain of Great Lakes in the north, and toward the mountains on the east and west. The only important departure from its uniform level character

is an elevation of from 500 to 2000 feet, running from southern Missouri through north-western Arkansas into eastern Oklahoma, and known as the Ozark Mountains. This great valley occupies about one-half the entire area of the United States, and the fertile prairies and bottom-lands of the eastern and central portions make it the most important agricultural basin of the globe. From an irregular line west of the Mississippi River the land rises in an almost imperceptible slope till it reaches the base of the western plateau. Much of this region, known as the Great Plains, has a light rainfall and is less favourably adapted for agricultural purposes than is the eastern portion, but it affords admirable and extensive pasturage.

The western or Pacific system of mountains forms a part of the vast elevation which extends from the northern to the southern extremity of the western continent. In the United States it is a great plateau of 4000 to 10,000 feet surmounted by a complex system of ranges, in its widest part more than 1000 miles broad. Of this Cordilleran region the Rocky Mountains form the eastern and the Sierra Nevada and Cascade Mountains and the Coast Ranges the western border. (For these ranges see separate articles.) In the ranges of central Colorado alone nearly forty of the summits have an altitude of more than 14,000 feet. The culminating point of the Rocky Mountains is Blanca Peak (14,463 feet). In the Wind River Mountains, in Wyoming, are the head-waters of the Colorado, the Columbia, and the Mississippi, the three great river-systems of the United States; and in the north-western corner of the same state is situated the National Park, famous for its hot springs and geysers as well as for its magnificent scenery (see YELLOWSTONE). Between the Wahsatch Range and the lofty masses of mountains in Colorado is a region of peculiar interest, consisting of level plateaus, in which the changes of elevation from one plain to another are marked by abrupt descents and steep cliffs. It is furrowed by cañons or gorges, whose sides are nearly vertical; and the bed of the Colorado (q.v.) is in some places more than a mile and a quarter below the surface of the plateau. Between the Wahsatch Range and the Sierra Nevada lies the Great Basin (q.v.), an immense tract having at best but little rainfall, except upon the summits of the ranges by which it is traversed, and none of whose waters are drained to either ocean. Much of this region is at present an absolute desert, although within comparatively recent geological time the conditions were such that two great fresh-water lakes, one nearly as large as Lake Erie, the other more than twice that size, occupied the now arid area. The saline swamps, salt lakes, and sinks of Nevada indicate the former location of one of these lakes; Great Salt Lake is all that now remains of the other.

The Sierra Nevada and the Cascade Range are topographically continuous, and constitute a great mountain-wall which so far as the height of the peaks and the grandeur of the scenery are concerned is one of the most striking portions of the Cordilleran system. Most of the peaks of the Sierras are, however, of granite and metamorphic rock, while those of the Cascade Range are volcanic. The greatest altitude is attained between the parallels 36° and 37°, with Mount Whitney (14,898 feet) as the culminating point. The lofty character of the range is maintained throughout the greater part of California, and the sublimity of the scenery is justly celebrated (see YOSEMITE VALLEY). Between the parallels 39° and 40° the volcanic character of the peaks comes into prominence. From this point there extends northward one of the most remarkable groups of extinct or faintly active volcanoes to be found anywhere in the world: the lava overflows in this region cover an area of above 200,000 sq. m. The most prominent peaks are Mount Shasta (14,442 feet) in California and Mount Rainier (14,444) in Washington. In three separate places rivers have cut a passage through the volcanic portion of the range. The most notable is the passage of the Columbia River in a grand cañon more than 3000 feet in depth. The region which lies north of the Great Basin, between the Cascade Range and the Rocky Mountains, is known as the Northern or Columbian Plateau. Much of it is covered by material thrown out in volcanic eruptions, and has been eroded not only by the Columbia, but by its tributaries. The Shoshone Falls (q.v.) of the Snake River probably rank next to Niagara in grandeur. The Coast Ranges of Washington, Oregon, and northern California consist of numerous and approximately parallel chains, which as a rule pitch off abruptly toward the sea, leaving no coast-plain. Between the Coast Ranges and the Sierra Nevada and Cascade Range is a series of broad valleys, occupied mainly in Oregon by the Willamette River and in California by the Sacramento and San Joaquin. In southern California the mountains of the Coast Ranges diminish in height, but throughout their whole extent they are interspersed with picturesque and fertile valleys.

The drainage of the United States is determined by its physical structure, which is such as to make the country pre-eminent for the number and length of its navigable rivers, and for the abundance and size of its lakes. The lake region lies in the northern part of the country, forming a part of the great belt of lakes which sweeps in a broad curve around Hudson Bay as a centre, and extends from the Atlantic to the Arctic Ocean. Besides the chain of Great Lakes which forms a part of the northern boundary, there are thousands of lakes in the New England states and in New York, nearly ten thousand in Minnesota, and numerous mountain-lakes among the Cordilleras. The peculiar lacustrine character of the northern portion of the United States is undoubtedly a legacy of the glacial period, and it is also a fact worthy of notice that this belt of lakes lies mainly in the customary path of the great cyclonic storms. Most of the important rivers of the United States also have their origin in its northern sections. The drainage areas may be broadly classified as the Great Lake or St Lawrence, the Atlantic, the Pacific, and the Great Basin or interior systems of drainage. The tributaries of the Great Lakes and the St Lawrence within the United States are rather insignificant, but the Lakes themselves form a feature of obvious importance. In the Atlantic system is included all the drainage which ultimately reaches the Atlantic Ocean, but for convenience the rivers might be further subdivided into two classes, one comprising the streams flowing directly into the sea, the other comprehending those of the Central Valley which discharge their waters into the Gulf of Mexico. The rivers of the Atlantic slope rise in the Appalachian mountain region, and are shallow and rapid until they reach the terrace which divides the highland from the true coast region. In this latter portion of the course they are as a rule navigable. The upper courses of the streams furnish available water-power, and have played a conspicuous part in developing the manufacturing industries. The Penobscot, Kennebec, Merrimac, Thames, and Connecticut in New England, the Hudson with its original commercial importance greatly augmented by the Erie and Champlain canals, and farther south the Delaware, Susquehanna, Potomac, James, Roanoke, Neuse, Cape Fear, Great Pedee, Santee, Savannah, Altamaha, and St John's are the prin-

cipal streams. The Mississippi-Missouri, with its tributaries the Ohio, Platte, Arkansas, and Red rivers, is the chief stream of the Central Valley. Its basin is second only to that of the Amazon, and in length and extent of navigable water it surpasses all other rivers of the world. East of the Mississippi are the Mobile and Appalachicola, and to the west the Sabine, Brazos, and Rio Grande. The Colorado, the Sacramento and San Joaquin, the Willamette, and the Columbia are the important streams emptying their waters into the Pacific. With the exception of the Sacramento and San Joaquin, and the lower portion of the Colorado, the rivers of the Pacific coast are not navigable. The rivers of the Great Basin are uncertain in volume and of no great size.

Climate.—With its great extent and its diversified topography, the United States has every variety of climate characteristic of the temperate zone. The annual isothermal lines, except where they

Political Divisions.	Capital.	Date of Admission as State.	Land Area in sq. miles.	Water Area in sq. miles.	Gross Area in sq. miles.	Population in 1920.	Population per sq. mile.
Alabama (ALA.)	Montgomery	1819	51,279	719	51,998	2,348,174	45·8
Arizona (ARIZ.)	Phœnix	1912	113,810	146	113,956	334,162	2·9
Arkansas (ARK.)	Little Rock	1836	52,525	810	53,335	1,752,204	33·4
California (CAL.)	Sacramento	1850	155,652	2,645	158,297	3,426,861	22·0
Colorado (COL.)	Denver	1876	103,658	290	103,948	939,629	9·1
Connecticut (CONN.)	Hartford	1788	4,820	145	4,965	1,380,631	286·4
Delaware (DEL.)	Dover	1787	1,965	405	2,370	223,003	113·5
District of Columbia (D.C.)	Washington	..	60	10	70	437,571	7,292·9
Florida (FLA.)	Tallahassee	1845	54,861	3,805	58,666	968,470	17·7
Georgia (GA.)	Atlanta	1788	58,725	540	59,265	2,895,832	49·3
Idaho (IDAHO)	Boise	1890	83,354	534	83,888	431,866	5·2
Illinois (ILL.)	Springfield	1818	56,043	622	56,665	6,485,280	115·7
Indiana (IND.)	Indianapolis	1816	36,045	309	36,354	2,930,390	81·3
Iowa (IOWA)	Des Moines	1845	55,586	561	56,147	2,404,021	43·2
Kansas (KANS.)	Topeka	1861	81,774	384	82,158	1,769,257	21·6
Kentucky (KY.)	Frankfort	1792	40,181	417	40,598	2,416,630	60·1
Louisiana (LA.)	Baton Rouge	1812	45,409	3,097	48,506	1,798,509	39·6
Maine (ME.)	Augusta	1820	29,895	3,145	33,040	768,014	25·7
Maryland (MD.)	Annapolis	1788	9,941	2,386	12,327	1,449,661	145·8
Massachusetts (MASS.)	Boston	1788	8,039	227	8,266	3,852,356	479·2
Michigan (MICH.)	Lansing	1837	57,480	500	57,980	3,668,412	63·8
Minnesota (MINN.)	St Paul	1858	80,858	3,824	84,682	2,387,125	29·5
Mississippi (MISS.)	Jackson	1817	46,362	503	46,865	1,790,618	38·6
Missouri (MO.)	Jefferson City	1821	68,727	693	69,420	3,404,055	49·5
Montana (MONT.)	Helena	1889	146,131	866	146,997	548,889	3·8
Nebraska (NEB.)	Lincoln	1867	76,808	712	77,520	1,296,372	16·9
Nevada (NEV.)	Carson City	1864	109,821	869	110,690	77,407	0·7
New Hampshire (N.H.)	Concord	1788	9,031	310	9,341	443,083	49·1
New Jersey (N.J.)	Trenton	1787	7,514	710	8,224	3,155,900	420·0
New Mexico (N.MEX.)	Santa Fé	1912	122,503	131	122,634	360,350	2·9
New York (N.Y.)	Albany	1788	47,654	1,550	49,204	10,385,227	217·9
North Carolina (N.C.)	Raleigh	1789	48,740	3,686	52,426	2,559,123	52·5
North Dakota (N.DAK.)	Bismarck	1889	70,183	654	70,837	646,872	9·2
Ohio (OHIO)	Columbus	1802	40,740	300	41,040	5,759,394	141·4
Oklahoma (OKLA.)	Oklahoma City	1907	69,414	643	70,057	2,028,283	29·2
Oregon (ORE.)	Salem	1859	95,607	1,092	96,699	783,389	8·2
Pennsylvania (PA.)	Harrisburg	1787	44,832	294	45,126	8,720,017	194·5
Rhode Island (R.I.)	Providence, Newport	1790	1,067	181	1,248	604,397	566·4
South Carolina (S.C.)	Columbia	1788	30,495	494	30,989	1,683,724	55·2
South Dakota (S.DAK.)	Pierre	1889	76,868	747	77,615	636,547	8·3
Tennessee (TENN.)	Nashville	1796	41,687	335	42,022	2,337,885	56·1
Texas (TEX.)	Austin	1845	262,398	3,498	265,896	4,663,228	17·8
Utah (UTAH)	Salt Lake City	1896	82,184	2,806	84,990	449,396	5·5
Vermont (VT.)	Montpelier	1791	9,124	440	9,564	352,428	38·6
Virginia (VA.)	Richmond	1788	40,262	2,365	42,627	2,309,187	57·4
Washington (WASH.)	Olympia	1889	66,836	2,291	69,127	1,356,621	20·3
West Virginia (W.VA.)	Charleston	1863	24,022	148	24,170	1,463,701	60·9
Wisconsin (WIS.)	Madison	1848	55,256	810	56,066	2,632,067	47·6
Wyoming (WYO.)	Cheyenne	1890	97,548	366	97,914	194,402	2·0
Continental United States	.....	.....	2,973,774	53,015	3,026,789	105,710,620	35·5
Alaska Territory	Juneau	..	..	..	590,884	55,036	·09
American Samoa	Pago Pago	..	..	..	77	8,056	107·4
Guam	Agana	..	..	..	210	13,275	64·4
Hawaii Territory	Honolulu	..	..	..	6,449	255,912	39·9
Panamá Canal Zone	....	..	..	..	527	22,858	43·4
Philippine Islands	Manila	..	..	..	115,026	10,314,310 (1918)	90·2
Porto Rico	San Juan	..	..	..	3,435	1,299,809	378·4
U.S. Virgin Islands	St Thomas	..	..	..	132	26,051 (1917)	195·9
Non-Contiguous Territory	.....	.....	.....	.....	716,740	12,112,545	16·9
United States	Washington	.....	.....	.....	3,743,529	117,823,165	31·5

are influenced by the two great mountain-systems, pursue a fairly uniform east and west course across the country. They are somewhat deflected to the south by the Appalachian Mountains; but though the high mountain regions produce great local deflections of these lines, a vast elevated mass like the Cordilleran Plateau does not seriously affect the mean annual temperature. In the southern part of the plateau there is a slight general deflection toward the south, but in Montana and the north-western portions of the country the isotherms indicate a warmer annual mean than that prevailing farther east. A marked difference is, however, observable in the disposition of these lines on maps representing respectively the summer and the winter temperatures. The influence of the oceans and of the Great Lakes is at once apparent. Both the heat of summer and the cold of the winter season are greatly modified, whereas in the interior and in the region of the Cordilleras the extremes

of heat and cold are both abnormally great. The warm ocean current of the Pacific, which bathes the western coast, produces a more uniform temperature than that which is found on the Atlantic seaboard, along which flows a cold polar current. The annual range of temperature is very great. In winter there sometimes exists at the same instant between the northern and the southern borders a difference of 120°. In summer the diurnal variation of a single locality is in some instances from 40° to 50°. A narrow strip in the south, including the southern portions of Florida, New Mexico, and Arizona, has what may be called a tropical climate. Northern Florida, southern Louisiana, southern Texas, and portions of New Mexico, Arizona, and southern California have a subtropical climate. The sugar and rice regions have a mean annual temperature above 70°. The tobacco region lies between the isotherms of 50° and 60°. The annual temperature of the great cotton region ranges from 60° to 68°, and the prairie regions devoted to the raising of wheat and other hardy cereals seldom have an average temperature above 55°. On the wheat fields of the Dakotas the annual mean does not exceed 45°. The rainfall of the United States varies greatly in different sections, not only as to quantity, but as to distribution throughout the year. The eastern part of the country is well watered, having not only an ample supply, but an average rainfall for any month which in the long run does not vary much from that of any other month. The requisite moisture is furnished by the Gulf of Mexico and the Atlantic Ocean. The western portion, excepting the strip between the Sierras and the Cascade Range and the Pacific Ocean, and a few limited areas favoured by some peculiar features of topography, has an insufficient supply, and agriculture is dependent for success upon Irrigation (q.v.). Between the two regions is a belt approximately following the meridian of longitude 100°, in which agriculture may sometimes be carried on without recourse to irrigation, but which in any season is liable to suffer from drought. The rainfall of the Pacific coast is peculiar. The westerly winds crossing the warm oceanic current are laden with moisture, which is precipitated whenever the air is sufficiently cooled to lower the dew-point. In Washington, where the land is relatively cooler than the sea for the greater part of the year, rains are frequent, but heavier in winter than in summer. Farther south the land is warmer than the sea in summer, but cooler in winter, so that in northern and central California, for example, there is a wet and a dry season. In southern California, where the land is, as a rule, warmer than the sea, there is little or no rain, and an arid climate prevails.

The eastern portion of the United States is in the main well wooded. Forests also occur in northern California, Oregon, Washington, and in northern Idaho and Montana. The Cordilleran region and the Great Plains are treeless, except upon high plateaus and mountains. The limit of the growth of trees in the east is approximately marked by the same line which separates the region of ample from that of insufficient rainfall. In fact the distribution of forests very closely follows the distribution of rainfall. There is, however, a tract in the central portion of the country, between the parallels 39° and 43°, which at the time of the advent of the white man was a prairie region with very little woodland. The conditions of rainfall and evaporation, together with the prevalence of prairie fires in this area, were such that apparently trivial circumstances turned the tide against forests. With a modification of these conditions by the increase of civilisation, the prairie regions are disappearing and wooded tracts are increasing.

Political Divisions.—Under its present organisation the United States comprises forty-eight states besides its non-contiguous territories and dependencies. These forty-eight states enjoy the full privileges afforded by the federal constitution. In addition, there is the District of Columbia, which contains and is co-extensive with the city of Washington, the capital of the United States. There are also two territories, Hawaii and Alaska, and several dependencies, viz., the Philippine Islands, Porto Rico, the Virgin Islands, the Panamá Canal Zone (administered by the War Department), American Samoa, the Midway Islands, (administered by the Navy Department, as are also the islands of Guam and Wake). Statistical details of the states, territories, &c., are given in the table on page 317. Both the land and the water area are given in accordance with the computations of the census of 1920. The chain of Great Lakes is excluded from the calculations of enclosed water surfaces. It is worthy of remark that the centre of population has advanced westward since 1790 in a nearly uniform line along the 39th parallel of latitude, having progressed from a point 23 miles east of Baltimore to a point 10 miles west of Bloomington (Ind.), a distance of 568 miles. Of the total population 94 per cent. of the inhabitants live in that part of the country which is drained to the Atlantic Ocean, and more than one-half live in the region drained by the Gulf of Mexico. The greatest density of population is in the region having a mean annual temperature of from 50° to 55°, rapidly diminishing with the increase or decrease of temperature. In 1920 three cities, New York (over 5,000,000), Chicago, and Philadelphia, had a population of over 1,000,000. Detroit, Cleveland, St Louis, Boston, and Baltimore had each over 700,000. Thirteen cities had over 300,000; twelve cities between 200,000 and 300,000; thirty-five between 100,000 and 200,000; seventy-six between 50,000 and 100,000; one hundred and forty-three over 25,000 and under 50,000; in all there are 287 cities of over 25,000, aggregating 37,770,114. See also the articles on the states, territories, rivers, lakes, &c.

GEOLOGY AND MINERAL RESOURCES.

The continent of North America began to be developed in the earliest time of which we have as yet any knowledge. It is evident that this part of the world was the seat of certain land areas in the Laurentian age, though we cannot as yet determine the form or position of these ancient islands. In the period of the Lower Cambrian we know that there were dry lands in the Rocky Mountain district, in the region to the south and east of Hudson's Bay, extending as far south as northern New York and along the Atlantic coast from Labrador to Georgia and Alabama. These islands, probably in area small as compared with the present surface of the continent, in a general way outlined the form of the great land. Its subsequent development has been in the main on the lines which were thus traced, the islands of the ancient archipelagoes having become united and extended as the continental elevation has been gradually uplifted above the level of the sea. During the Silurian and Devonian periods not only were the lands enlarged, but the seas lying between them were shoaled, so that the great Mediterranean included within the eastern, northern, and western groups of islands was converted into shallow water.

In the early stages of the Carboniferous period a great portion of the continent, which had gradually been rising from the depths of the sea, was uplifted above the ocean's level and converted into low marshy plains upon which developed the luxuriant swamp vegetation from which the deposits of coal

were formed. These plains of the coal-making age were mainly developed within the limits of the United States, occupying a broad field to the west of the ancient mountain-ranges of the Blue Ridge, stretching thence for the greater part of the distance across the valley of the continent to the westward. A fringe of similar lowlands lay along the Atlantic coast from Labrador to the southern part of New England. In this age the continent, which has always been subject to oscillations of level, appears to have been peculiarly unstable, so that from time to time the swamps which were formed on these plain lands were lowered beneath the waters, and their accumulations of peaty matter were buried beneath layers of sand, gravels, and mud, after a while to be again elevated and reconverted into swamps. By these successive movements the peaty matter, which has gradually been converted into coal, was imbedded in the rocks of the Carboniferous period. In the time when the Triassic rocks were formed there came one of the greatest periods of mountain-building which the continent has experienced. The ranges of the Alleghany system, extending from near New York to Alabama, were uplifted, and about the same time the region of the Cordilleras or Rocky Mountains underwent extensive elevation. Coincident with these movements the great central trough of the continent, now occupied by the rivers of the Mississippi system, rose so far above the level of the sea that North America took on something like its present outline.

Until the close of the Carboniferous time the central portion of the continent, though occasionally and in parts above the level of the sea, had never been brought for any length of time above the ocean's level. With possible exceptions there appears always to have been a sinus or strait connecting the waters of the northern and eastern ocean with the Gulf of Mexico. During the Jurassic and Cretaceous periods a northward extension of the Gulf of Mexico more or less constantly occupied a portion of the continent lying to the east of the Rocky Mountains, and perhaps extending to near the Mississippi River. It is not certain that this sea extended to the Arctic Ocean, but it probably united the waters of the north and south for a portion of these ages. A further elevation of the continent occurring in the later Cretaceous time reduced this great central bay to the state of very extensive fresh-water lakes, which formed a fringe along the eastern border of the Rocky Mountains. These basins were gradually filled with the waste from the neighbouring highlands; and, with the slow uprising of the continent which occurred in the later Tertiary time, the rivers which drained them carved their ways to such depths that these remnants of the continental seas disappeared. To these same relatively recent elevations we owe the uplift of the great southern plain about the Gulf of Mexico which reduced the old American sea to its present narrow limits in the gulf just named.

The elevations which took place during the Tertiary period were in the eastern part of North America unattended by any considerable crumpling or folding of the rocks, such as produces mountains. In the western portion of the continent, however, the mountain-building forces, from the beginning more constantly active than in the eastern district, profoundly affected the topography of the surface. This greater intensity of mountainous growth in the western portion of North America was attended by a development of volcanic activity in that part of the continent. In the region east of the Mississippi this form of geological activity has not been distinctly manifested since the Triassic time.

The last great geological accident of North America consisted in the wide-spread extension of glaciers, which in a relatively very recent time occupied the surface of the country from the high north to the central portions of the United States, covering the greater portion of the land as far south as the parallel of 40°. Although this visitation of the ice occupied a relatively brief period, it greatly affected the surface of the country, and has had a profound influence upon the character of its soils. During the glacial period the surface of North America appears to have been subjected to remarkable oscillations of level—at least in the district east of the Mississippi River—the northern portions having sunk down, probably in consequence of the burden of ice laid upon them, while the southern parts were correspondingly elevated. At present, the ice having recently passed away, the form of the continent appears to be undergoing some readjustment, a considerable portion of the Atlantic coast in the region south of New York being in process of down-sinking.

The geological resources of the United States include a greater variety of economically valuable substances than has as yet been found within an equal area in the other parts of the world. Most of these may for convenience be classed as carbonaceous materials, metalliferous substances, and architectural materials. The first group includes the varieties of coal, petroleum, and the burnable rock gases. These three classes of substances exist in remarkable quantities in the United States, particularly in the region to the east of the Mississippi River. Probably nine-tenths of the workable deposits of carbonaceous material contained in North America lie in the district between the Blue Ridge Mountains and the Mississippi River. As there are no considerable coal-fields in the Canadian Dominion or in the countries which lie to the south of the Federal Union, it follows that the United States possesses by far the greater part of the subterranean fuels which the continent contains. The Appalachian coal-field, together with the somewhat detached area lying in western Kentucky and the southern parts of Indiana and Illinois, contains over 60,000 sq. m. of workable coal-deposits. In the western portion of the country there are a number of small coal-basins, mostly formed in later ages than the Carboniferous, which afford fuels of lower grade than those obtained from the true coal-measures, and which are of only local importance. On the Atlantic coast to the east of the Appalachian Mountains there are several small coal-fields, of which those about the Gulf of St Lawrence and about Narragansett Bay in the states of Rhode Island and Massachusetts are of Carboniferous age, while those near Richmond, Virginia, and in the valley of the Dan River, North Carolina, were formed in the Triassic time. By far the larger part of the fields have the fuel in the ordinary bituminous state. Some small areas in the mountain-built districts afford anthracites varying in quality from excessively anthracitic coal, such as is found in the Narragansett district, to materials which verge on the bituminous state. The coals found in the Cordilleran region, especially those deposited in the later geological ages, generally belong to the group of lignites. The coals of the United States possess the advantage that they are prevailingly of excellent quality, being especially well suited for use in smelting ores, and they generally lie in positions where they may be mined by means of horizontal galleries penetrating from the neighbouring valleys.

The strata containing economically valuable deposits of petroleum lie in the rocks between the Cambrian and the Carboniferous, though there are some small basins which afford rock-oils in the more recent beds of the Cordilleran mountain district. The greater part of these burnable fluids

is obtained from the horizontally stratified rocks lying in the valley of the Ohio River. In this field the product is obtained from a number of distinct areas, where the decomposition of the organic matter buried in the rocks at the time of their formation has produced the petroleum, and where the physical condition of the strata has led to the safe storage of the material in the strata. The range in quality of the American petroleum is great, some of the fields yielding oils of a light nature, others producing forms of the substance suitable for lubricating machinery.

The rock gases of a burnable nature, which were formed under substantially the same conditions as those which led to the production of petroleum, are somewhat more widely distributed than the fluid materials. They occur wherever rocks rich in organic matter, and in which the gases are produced, are overlaid by impervious strata. The beds where these gases have been proved to exist in economically important quantities extend, though not in a continuous way, from central New York southward and westward through the Ohio valley. Similar deposits, though as yet of unknown value, exist in the more western portions of the country. The utilisation of natural gases for lighting and heating is an industrial feature which is almost peculiar to the United States.

The most important metallic resources of the United States are found in its iron ores. These exist in great quantities in various parts of its territory. On the Atlantic slope north of New York City the only important deposits lie in the valley of the Hudson, and are mainly magnetic oxides. In Virginia, and thence southward in the Appalachian mountain-system to central Alabama, there are very rich beds of limonite ores which lie in the horizons of the Cambrian. Farther to the west the rocks of the Clinton epoch in the Upper Silurian age contain some layers of limonites and hematites, which are remarkably continuous deposits extending with few breaks from Lake Ontario to Alabama. In the northern part of the field these deposits rarely exceed a foot in depth, but they thicken to the southward until, in the region beyond the Tennessee River, they often have a depth of from 10 to 20 feet. The portion of the Appalachian iron-field from the Potomac southward has the advantage that the ore-beds lie near to coals which afford excellent coke, and are in the immediate vicinity of limestones which are well suited for fluxing purposes. It is characteristic of these southern ores of iron that they are rarely in the form of magnetic oxides, and that they are prevailingly too phosphatic for the manufacture of steel by the Bessemer process, though they are well suited to conversion by means of the basic method of reduction. In the region about the western extremity of Lake Superior, particularly in the states of Wisconsin, Minnesota, and Michigan, there are very extensive deposits of high grade iron ores, principally magnetites, which, though occupying a much smaller field than those of the Appalachian district, have been for years the seat of the most extensive production of iron ore in the country. These beds appear to be in strata lying between the true Laurentian and the Cambrian deposits. Owing to the fact that coal is lacking in this district, almost all the ores are shipped away to the regions in the south and east where coke from the Appalachian coal-fields may be had. Most of the ores from the Lake Superior district are used for the manufacture of iron which is to be converted into Bessemer steel, while the ores from the Appalachian field serve in the main for the qualities of iron used for ordinary castings. In the region of the Cordilleras there are very great deposits of iron ore which occasionally, as at Leadville, are associated with the precious metals; but as yet these iron-fields have been but little explored.

The next most important metal in the United States is copper, which is widely distributed both in the metallic state and in that of ores. In the older rocks of the Appalachian Mountains it occurs in mineable quantities at a number of points from central New Hampshire to eastern Tennessee. Formerly the production from these mines of the eastern mountain-system was considerable; but the copper district of Lake Superior, which is limited to a small field in northern Michigan, has since the decade 1860–70 been the principal seat of production of this metal in North America. It is an eminent peculiarity of the mines in this region that they afford the substance in the metallic state: sometimes it occurs in the form of very great sheets of an indistinctly lens-like form, each of which may contain scores or even hundreds of tons of the metal. The deposits occur in rocks which were formed in Cambrian or perhaps in earlier times, and they lie in beds of conglomerate, or in accumulations of volcanic ash. At various points in the Cordilleran region, particularly in Montana and Arizona, there are deposits of copper ores which have been accumulated in wide veins, and which contain small amounts of gold and silver. Although the production of the metal from these ores is more costly than in the case of the mines of Lake Superior, these fields of the Rocky Mountains are very productive, and vie with those of Michigan in their contributions to the market.

Lead ores, mainly in the form of galena, occur in great quantities and with a wide distribution in the United States. The easternmost region which has yielded a considerable supply is in Iowa and Illinois, where the mines of this metal were in the middle part of the 19th century of much importance, though they have been rendered almost valueless by the cheaper production in the more western states. In Missouri galena occurs in large quantities commingled with zinc blende, and is produced in considerable quantities. But the present source of supply is mainly from the silver-bearing lead ores in the Rocky Mountains. Many great vein deposits in that district consist of lead ores which contain a sufficient amount of silver to make them profitable for the precious metal alone, so that the lead is produced as a by-product and practically without cost. The ores of zinc occur in economically valuable quantities in the Appalachian district south of New York, in Missouri, and at various points in the Cordilleras.

We have now noted the most important of the grosser metals which occur in economically valuable quantities in the United States. The following named, however, deserve mention because of their incidental value in the arts. Oxide of manganese is found in workable quantities at various points in the southern Appalachian district, in western Arkansas, and at various places in the Cordilleran region; iron pyrites in numerous large veins in the Appalachian and Rocky Mountain districts, the ore commonly containing a share of copper, and not unfrequently some gold; and the ores of tin at many points in the older rocks of the eastern and western mountain-systems, but so far not in conditions to have any commercial value—although recent discoveries appear to indicate that the metal may occur in quantities sufficient to repay mining in the Black Hills of South Dakota. Nickel has been mined in Pennsylvania and in Oregon, the last-named region giving promise of a considerable production. The country has a full share of the world's gold and silver, and platinum occurs, though it is not yet economically valuable.

In the Appalachian region ores containing silver in quantities to profit the miner are unknown. Gold-bearing rocks are there widely distributed, but the veins containing the metal are commonly lean, and the mines opened on them have been unremunerative except in the region south of the Potomac, where during the slave-holding time a considerable amount of gold was produced by the use of this cheap labour. Gold and silver occur in conditions to tempt the miner in the region about the west end of Lake Superior; but, though some of the deposits have been temporarily productive in former years, the efforts to win these metals in this district have on the whole been unremunerative. From the eastern face of the Rocky Mountains westward to the Pacific coast deposits of varied character containing silver and gold are extremely abundant. In fact this portion of the Cordilleran region appears to be the richest in precious metals of any equal area in the world. The silver of this district generally occurs in combination with galena, and has thus been won so cheaply and in such quantities as greatly to lower the price of the metal in the world's markets. The gold of this region occurs partly in ordinary lodes of varied character, and partly in deposits of gravel, sand, and clay, which occupy extensive areas in the river-valleys, especially in the state of California. Although in all countries where gold has been mined more or less considerable portions of the metal have been won from alluvial deposits, these auriferous gravels of the Cordilleran district have attained an economic importance unknown in any other country, and have become the seat of a peculiar kind of mining known as the hydraulic process (see GOLD). So extensively was this hydraulic mining carried on that the beds of the rivers in the lowlands became filled with the debris which was thus washed into them, and the sands overflowed wide areas of tilled land. On this account it has been found necessary in California to limit its practice by law.

Not only the existing river-valleys of the Cordilleran region contain gold-bearing gravels, but many ancient stream beds, which were filled with lava by volcanic eruptions and have since been left by the down-wearing of the country high above the drainage level, also contain deposits of the precious metal commingled with alluvial material. The precious metal deposits of the Cordilleras differ in an interesting way from those of other countries. The Comstock lode of Nevada is not only remarkable for its great width and the surprisingly rich though widely separated pockets of ores of gold and silver which it afforded, but also for the extraordinarily high temperature which is encountered at from 1000 to 2000 feet below the surface. Although this heat is variable in different parts of the mine, it occasionally amounts to more than 120° F., making the work of mining extremely costly. In Nevada and elsewhere ores of silver, and less commonly of gold, are often found deposited in caverns originally excavated by the waters of hot springs, and since more or less completely filled with deposits bearing those metals.

The architectural stones of the United States, though on the whole less varied and ornamental than those of the Old World, are abundant and well suited to the needs of construction. In the eastern part of the Appalachian district, particularly in New England, granitic and other related rocks of excellent quality for building plentifully occur. The marbles of Vermont are the seat of a great quarrying industry, and are excellent for the builder's use. Similarly extensive deposits occur in north-western Georgia. In this Appalachian section also occur many deposits which afford good roofing slates, and the sandstones of Triassic age are well suited for architectural work. In the central parts of the Mississippi valley the unmetamorphosed strata of Palæozoic age afford many varieties of limestone and sandstone which are serviceable for building purposes. In the Cordilleran district we find the richest field for the quarrymen which the continent affords. In addition to the more ordinary varieties of building stone, there are many species of volcanic rock which are admirably adapted for constructive purposes, being easily worked, enduring, and of pleasing colours.

The varieties of clays used for making bricks of various kinds, and for pottery purposes, abound throughout the districts between the western portion of the Mississippi valley and the Atlantic seaboard. Certain clays found near Milwaukee produce, under skilful burning, brick of a very delicate buff colour. The refractory clays suited for resisting high temperature are very abundantly developed, especially in the rocks of Carboniferous age. Their frequent occurrence in this formation is due to the fact that the earth had the lime and other basic materials which cause ordinary brick to melt removed by the action of the roots belonging to the species of plants which form the coal-beds. Rocks affording cements abound in almost all parts of the country; but the product of the quarries is on the whole not as good as that obtained from similar deposits in England and Germany.

Among the most important mineral deposits of North America, and particularly of the United States, must be reckoned the phosphatic rocks which are used in the manufacture of agricultural manures. These accumulations in quantities sufficient to have a great commercial value are found in the district about Charlestown, South Carolina, and in a field having an aggregate area of about 1000 sq. m. in western Florida, bordering upon the Gulf of Mexico.

Although certain precious stones have been found within the limits of the United States, only sapphires, as at Yogo Gulch, Montana, occur in quantities sufficient to have distinct economic value.

The mineral springs of the eastern part of the United States do not exhibit a great variety, and, except in Virginia and North Carolina, none of them are sufficiently warm to be prized for their temperature. Hot springs of much medicinal value occur at Little Rock, Arkansas. Their waters have a higher temperature than those of any other part of the continent east of the Rocky Mountains. In the Cordilleran district the number of mineral springs and those of high temperature is exceedingly great. As yet their therapeutic value is imperfectly known, but it seems certain that ultimately they will prove to be of much value.

EDUCATION.

Introductory.—The country at large has no national system of education. By the constitution of the United States only such powers are vested in the federal government as concern the whole people. Education is left to the states, and a great variety of systems are to be found, varying according to the needs of the different regions, e.g. the cities of the east with their large foreign population, the old slave states of the south, and the agricultural districts of the west. The central government has contributed greatly and in many ways to the encouragement of schools and the integration of systems, and toward unifying the educational policies of local authorities. It has influenced the direction of educational thought, and fixed the character of educational institutions. It possesses, however, neither legislative nor administrative power to improve schools directly. The schooling of the Indians and special education

to fit for service in the army and navy only have been made a charge of the nation. There is maintained at the capital, however, as a division of the department of the interior, a 'Bureau of Education,' whose twofold function is to collect statistics and to diffuse information. Based upon the information voluntarily returned to it by local and state authorities, it issues an annual report, special reports upon educational questions, and numerous minor bulletins and 'circulars of information.'

By the general government also there is administered at Washington the Smithsonian Institution (q.v.); and still further, the federal government liberally supports special scientific inquiry, through the coast, geographical, and geological surveys, the Signal Service (or weather) Bureau, frequent naval explorations, and a national observatory, besides numerous publications of a scientific or historical character, incidentally connected with one or another of the several departments. Under the provisions of the 'Ordinance of 1787,' granting to each state organised thereafter section 16 (i.e. 1 sq. m.) in every township for school purposes; and by an Act of 1849 setting off 500,000 acres to each of certain specified states; and again by an Act of 1862 giving to each state 30,000 acres of land for every representative in congress, to be used in establishing schools of agriculture and the mechanical arts, land has been appropriated by the national government for various educational purposes in the states, aggregating nearly 120,000,000 acres. Since 1887 several acts have voted direct financial aid, with very beneficial results.

All educational systems in America are relatively recent. Except for some New England attempts made in Massachusetts by the law of 1647, and under the Connecticut Code of 1650, no effective movement for general education was inaugurated in the United States prior to the 19th century. In a few states permanent educational funds (hinting at centralisation and state control) were begun just after the revolution. But not until 1812 (in New York) was any law passed that could be construed as contemplating a uniform system for an entire commonwealth. That of Massachusetts, as now in force, dates from 1837. The Michigan system is a year older. Connecticut organised in 1838, and Rhode Island in 1843. But for the country at large the period of growth and integration of systems and of the centralisation of control includes little more than the years since 1870. The economic advancement of the country and the increased contact with the educated peoples of the Old World called for a more definite educational system. Closer supervision, the improvement of teachers, the revision of school courses, the introduction and multiplication of technical and trade schools, the adoption of the Kindergarten, and the marvellous development of free schools in the southern states characterise this period. In the 20th century educational policy has been less a campaign against mere illiteracy and more an institution of democracy, definitely equipping citizens with practical knowledge in the different spheres of life.

The public school system now is practically co-extensive with the nation. Theoretically, the state agrees to furnish schooling for all who seek it (restricted as to age only), schooling of any grade to any class, with free tuition in some states even through the university. But other agencies, whose management (whether private or parochial) is free from state oversight, also have the right to conduct schools, with or without the sanction of the state authorities.

Private Schools, &c.—Among the earliest of educational agencies in every section has been the church: not unfrequently the first schools among the pioneers have been veritable home missions. But now elementary denominational schools are neither numerous nor largely attended. The total enrolment of private and parochial elementary and secondary schools in 1924 was 1,727,264, while that of private high schools and academies was 216,522. But as an educational agency the church shows greatest zeal in establishing higher institutions of learning: a majority of the colleges entitled to grant degrees are denominational. There are also superior institutions, independent of both church and state, some of them endowed, varying greatly both as to quantity and quality of work, empowered to grant degrees. Private universities and colleges comprise about 84 per cent. of the total, and enrol five-sevenths of the total number of students; but normal schools for the training of teachers are mostly public institutions.

Public (State-controlled) Schools.—The public schools of all grades (1924) enrol approximately 24,280,000 pupils, not including 780,000 pupils at city evening schools. Moreover, of those in the public schools 84 per cent. are in the elementary grades (primary and grammar); 13 per cent. in the public high schools and academies; and 2 per cent. in the state colleges and universities, including students in the public technological schools and normal colleges. The first two of the grades mentioned constitute the 'Common School System' of the states, tuition in both of which is free. In most states admission to classes beyond high school involves the payment of a small fee, though most of these institutions have some endowment, and, in addition, most receive periodical appropriations from the legislatures that created them. The endowment for all such institutions organised since 1800 began in the Federal Act, 1785, granting out of the public lands one full township (later two) to each state for the establishment and maintenance of a 'Seminary of Learning.' This as a nucleus has been variously managed by the different states, and sometimes increased through special appropriations, &c. The state agricultural and mechanical schools have all grown up since 1865, taking their rise in the grant of land by congress in 1862, supplemented by that of money later. There are about 70 such colleges throughout the states, including 24 universities. An Act of 1917 provided national aid for agricultural and industrial training in high schools and such institutions, and some 5000 schools have interested themselves in the scheme.

Professional Schools.—Among the professions in 1924 theology ranked first with 166 schools, law second with 124, medicine third with 80, while dentistry, pharmacy, and veterinary medicine schools number 118. Law students numbered 35,700 (2100 women), medical students 18,800 (1200 women), theology students 12,400 (1170 women), and students of dentistry, pharmacy, and veterinary medicine 23,400 (1000 women). There should also be mentioned 1750 schools for nurses, with 55,000 students. A considerable number of the schools are affiliated to colleges or universities.

Supplementary Institutions.—There are 150 schools for the deaf, with 14,300 students; 63 schools for the blind, having 5000 students; 214 schools for the feeble-minded, with 62,000 pupils; and 145 reform schools, with 65,500. These schools for the defective and wayward classes are found in almost every state, and are generally public. For university education, see UNIVERSITIES.

Common School Statistics.—The accompanying table presents the population of the United States for the three census years 1870–1900–1920, together with the school enrolment for each year in the

common schools, its ratio to the total population, and the school attendance :

Year.	Population.	Enrolment.	Per cent.	Attendance.
1870.....	38,558,371	6,871,522	17·8	4,077,347
1900.....	76,149,386	15,341,220	20·38	10,513,518
1920.....105,710,620		21,578,316	20·4	16,150,035

The average number of school days for the entire country is a little over 168 days—i.e. about eight months. Rural schools are generally below and city schools above this average. Compulsory attendance, usually for children from 7 to 14 years of age, is enforced in all the states; and only if employment is obtained can the scholar leave before his sixteenth year.

Finances.—The funds necessary for the support of public schools are raised from several sources, state and local taxation being the chief. Permanent funds, of which the interest only is used, are provided by the sale of certain 'sections' of public domain set aside for the purpose in the townships of the newer states. There are also endowments by private gift or bequest. In 1924 the total amount expended on elementary and secondary public schools was $1,821,000,000, mostly derived from taxation and appropriation, state and local.

CONSTITUTION.

The constitution of the United States seeks at once to maintain, by its federal structure, a strong national government, and yet fully recognise the claims of separate and in a sense sovereign states. All powers not expressly given to the federal government remain with the several states or the people; and every state has the right of self-government in all ordinary matters of legislation and administration. The constitution of the federal government, like that of the separate states, was framed on the English model, with an executive head and a legislature in two houses.

The head of the executive of the United States is a president, who is commander-in-chief of the army, navy, and militia, and exercises a veto on the decisions of Congress. In the republic he wields the executive power—political, diplomatic, and military—which in a monarchy appertains to a king. President and vice-president are chosen, for four years, by electors appointed by the several states of the Union. The powers of president and vice-president are treated in a separate article on the PRESIDENT OF THE UNITED STATES. The president chooses a cabinet of ten members, each having charge of an administrative department, but none of them having a seat in Congress; cabinet government being thus precluded, and a very different complexion given to the parliamentary system as compared with the English plan. The Senate must approve the president's choice. Instead of a ministry responsible to the legislature as in Britain, in America the ministry is independent of the legislature, and cannot be removed during the four years which is its natural term of existence. The legislative power belongs to the Congress, which comprises a Senate and a House of Representatives. The powers of the two Houses, jointly and severally, are discussed in the article CONGRESS. Instead of the control inherent in the British plan, by which ministers sit in parliament, America has controlling committees nominated in the House of Representatives by the Speaker, who is thus not merely the chairman of the House, but the party leader. Party government in the English sense would seem not to have been contemplated or provided for. The history of the political parties known as DEMOCRATS and REPUBLICANS is dealt with in separate articles; and further information about the constitution is given in the section below on the history of the United States. The federal Senate and the national House of Representatives were a balanced compromise between the states and the nation; and the clauses on slavery were a compromise between the principles and feelings of the North and the South. By the 17th amendment to the constitution, however (1913), senators are chosen, two from each state, by direct popular vote, and hold office for six years. The Senate has the power of confirming or rejecting treaties with foreign powers. The House of Representatives is composed of members elected biennially by the citizens of the several states, the laws as to franchise, &c., not being precisely similar in all the states. Nearly all citizens over twenty-one years of age enjoy the franchise, amendments of the constitution having forbidden disqualification on the ground of race, colour, or sex. But there are various requirements throughout the different states, e.g. residence, registration, payment of taxes, literacy, &c. The number of representatives for each state is proportional to population (after the census of 1910, one for 211,877 inhabitants), making a total of 435. The territories send delegates who may speak but do not vote. Each state in the Union has its own constitution, which provides for a governor, legislature of two houses, and distinct judicial system. The details vary considerably in the various states, but are analogous to the constitution of the Union. The state legislature is supreme in all matters except those reserved for the federal government (i.e. matters concerning general taxation, treaties, &c.; army, navy, &c.; foreign and interstate commerce; coinage, weights, measures; trial and punishment of crime against the United States). The states are prohibited from laying import or transit duties on each other's goods, internal free-trade being thus secured. For the amendment of the constitution two plans, both difficult to work, are provided; initiative may come from two-thirds of both Houses of Congress, or from the legislatures of two-thirds of the states. There are nineteen amendments to the original constitution, the last two being in 1919 (liquor prohibition) and 1920 (woman suffrage). The interpretation and legal guardianship of the constitution is vested in the Supreme Court, whose judges are appointed by the president, with the consent of the Senate. Other federal courts are the circuit courts of appeal, and the district courts.

ECONOMIC DEVELOPMENT.

General Outline.—Although the North American colonies severed their political connection with Great Britain in 1776 they did not arrive at the beginnings of economic independence till the early 19th century. A considerable manufacturing industry to meet home needs sprang up while the manufacturing countries of Europe were engaged in the Napoleonic war, especially when the United States took arms against Great Britain in 1812. The development of the textile industry in New England was especially great, and of all the more importance because of the new cotton-growing industry in the south-western states. At the conclusion of the war the young industries were threatened with extinction because of the renewal of English competition, but were placed behind a tariff barrier from 1816 onwards. The 'westward movement,' aided by an increasing population and a fast-developing system of turnpikes, canals, and, later, railways, gave the new industries a secure home market, and by the period of the Civil War the United States ranked fourth among the manufacturing countries of the world.

The Civil War added a new stimulus to industry, both by its call for commodities and transport services and by the further tariff

duties which it called into being in 1861, 1864, and 1865. After the war there were periodical attempts to revert to a more liberal tariff system, but, though some reduction was accomplished in 1894, the Dingley tariff of 1897 was highly protective. The development of the United States during the latter half of the century constituted practically a revolution. Her tremendous natural resources—land, minerals, timber, and water-power—were revealed. By 1890 there was no longer a western 'frontier.' A Homestead Act was passed in 1862 to facilitate pioneer settlement, and huge tracts of cultivable territory were settled each decade, so that the United States became the chief source of food and raw materials for Europe. Arterial railways opened up the country from east to west, and the gradual reduction of freights facilitated transit and the localisation of industries and supplied a nation-wide market. By 1880 all the great trunk lines were in existence, and by 1900 the total length of railroad had almost reached 200,000 miles. Abuses in the railway companies, however, in the shape of stock-gambling, pooling, and discriminations called for continual state regulation (see RAILWAYS, p. 537; CARRIERS). When the turmoil of the Civil War had finally subsided development of the cotton and tobacco manufacturing industries in the south was a marked feature, and by the end of the century the United States had become the chief manufacturing country of the world.

The chief characteristics of the development of the United States in the 20th century have been the completion of the economic integration of the country and its emergence as a great commercial nation of the world. Industry has been localised and developed on the large-scale basis. The systems of standardised parts, labour-saving devices, and mass-production, and the concentration of capital have reduced waste to a minimum. These developments themselves have been precipitated by the extension of the foreign market. The value of imports and exports in 1900 amounted to 2220 million dollars, in 1910 to 4260, and in 1926 to 9220. A marked feature of the growth is the increase in the proportion of manufactures exported and in the proportion of raw materials imported. Before the World War a movement had been growing for a revision of the tariff, and was a main feature of the Democratic platform. Reductions were effected in 1909 and 1913, but duties were again raised in 1921 and 1922. The war added an enormous stimulus to the economic progress of the United States. It paralysed European productive powers, and, as in the case of the Napoleonic war, made the States the principal source of supply. There were, however, restraining influences, namely, the collapse of the trade-boom of 1920 and the revised tariff policies of European nations. The war also accounted for a great increase in American shipping, while the opening of the Panamá Canal, the establishment of the Philippines as a trading-base for the East, and the efforts of organisations in the interests of commerce such as the Pan-American Union and the Department of Commerce have led to a great extension of foreign commerce, especially in Eastern Asia and South America, and to a considerable development of the Gulf and Pacific ports.

The domestic trade of the United States is about ten times as great as the foreign trade. This fact is accounted for by the vast extent and richness of the country, by the system of communication, by its economic self-sufficiency, by its uniform commercial policy and absence of internal trade barriers, by the application of scientific methods to every department of business. The importance of the large concerns can be judged from the fact that corporations, although numbering only one-third of the businesses, account for more than seven-eighths of the value of the annual product. Legislation has fought an unsatisfactory battle against combinations, and has now even legalised them in certain directions (e.g. railways, foreign trade). Combination of labour to what is virtually industrial unionism has been accomplished principally under the American Federation of Labour, an association started in 1881 by Samuel Gompers; its membership in 1926 was 3,300,000. Railway extension has been less rapid since 1900, the present mileage being about 260,000 miles; most of the recent additions have been in the south and south-west, although electrical inter-urban railways have spread extensively in the north. Legislation to restrain railway combination has been active, but the tendency to eliminate competition has been eventually legalised in the Transportation Act of 1920. River traffic is confined largely to cheap, bulky goods and has declined, although the traffic on the Great Lakes has increased. The requirements of automobile traffic have called for a wide extension of the road system.

Population.—The first census of the Union was taken in 1790, when it comprised thirteen states; in 1820 there were twenty-three states and three territories; in 1860 thirty-three states and five territories; in 1880 thirty-eight states and nine territories; in 1900 forty-five states and five territories; in 1910 forty-six states and three territories; in 1920 forty-eight states and two territories, besides the District of Columbia and foreign dependencies. In 1798–1920 the population of contiguous territory increased as follows (see table at p. 317):

Year.	White.	Free Coloured.	Slave.	Total
1790.....	3,172,006	59,527	697,681	3,929,214
1820.....	7,862,166	233,634	1,538,022	9,633,822
1860.....	26,922,537	488,070	3,953,760	31,443,321
1880.....	43,402,970	6,580,793	....	50,155,783
1890.....	54,983,890	7,470,040	....	62,622,250
1900.....	67,308,998	8,840,388	....	76,149,386
1910.....	81,731,957	10,240,309	....	91,972,266
1920.....	94,820,915	10,889,705	....	105,710,620

The Indian population is about 245,000, situated largely in Oklahoma, Arizona, South Dakota, and New Mexico. Negroes number about 10,000,000, and are most numerous in the south-eastern states, though they are rapidly migrating northwards. Over 13 per cent. of the population is foreign-born, and 21 per cent. more is of foreign or mixed parentage. The number of immigrants admitted to the United States during the century 1820–1920 was 33,000,000, and on six occasions since 1905 the annual admission has exceeded 1,000,000. The arrival of large numbers of unskilled immigrants, especially from south and east Europe, gave rise to serious social and economic problems, and since 1882, when a law was passed to restrict Chinese immigration, the legislature has actively concerned itself with the question. The principal methods of restriction adopted are the head-tax, exclusion of certain types (feeble-minded, anarchists, illiterate, &c. &c.), and the quota system, limiting the annual immigration of particular nationalities to a certain small percentage of the number already admitted.

Religion.—There is no state church in the United States. In 1923 the Roman Catholics claimed to have 18,260,000 of the population; the Methodists, 8,430,000; Baptists, 8,190,000; Presbyterians, 2,500,000; Jews, 400,000; Lutherans, 2,460,000; Disciples of Christ, 1,380,000; Congregationalists, 858,000; the Episcopal Church, 1,130,000; Reformed Church (German and Dutch), 533,000; besides Friends, Mormons, United Brethren, and others.

Agriculture.—The rapid growth of cities and of an industrial population together with the great amount and fertility of the land has always made

agriculture a vital interest in the national economy of the United States. Though there are still considerable areas to be settled, especially in Nevada, appropriation proceeds fast, and the price of land is rapidly rising. One-tenth of the population is engaged in agriculture. The farms number about 6½ millions, and two-thirds of them (the proportion being considerably higher in the north) are owned by the tenants. The United States is by far the most important grain-producing country in the world. The cereals come chiefly from the north-central states of the Mississippi basin; they are maize, wheat, oats, barley, rye, buckwheat, and rice. Cotton, in spite of the attacks of the boll-weevil, now claims nearly 50,000,000 acres in the southern states, Texas being easily the chief cotton state. Tobacco is cultivated mainly in North Carolina, Kentucky, and Virginia, sugar-cane in Louisiana, and fruit in California, Washington, and New York. Stock raising is important in Texas and the north-central states, though the industry as a whole is declining slightly. Dairy-farming is carried on extensively in the north-eastern states to supply the manufacturing localities. A feature of the 20th-century agriculture has been the realisation that extensive cultivation of the land must give way to intensive if the growing needs of the population are to be met. All kinds of labour-saving farm machinery are now in constant use, while there has also been a marked increase of irrigation and reclamation projects, carried out largely under government supervision in California, Colorado, and other western states. Further aid for the farmer has been provided in the system of federal land-banks, loan-associations, state experimental stations and colleges, and numerous co-operative purchasing and marketing organisations.

Manufactures and Mines.—In 1920 about 13 per cent. of the population was engaged in the manufacturing and mining industries. The total value of the product for 1923 was 66,542,498,000 dollars, or (although allowance must be made for inflated values surviving from the boom of 1920) about eight times the corresponding figure for 1900. Expressed in the order of the value of their products, the six most important manufacturing industries are those concerned with food and kindred products (especially slaughtering and meat-packing, centred at Chicago), textiles and their products —the United States is the largest consumer of raw cotton, but ranks after Great Britain in the value of the finished products—iron and steel, chemicals and allied products, transportation, equipment, and machinery. The most important single industry is that of motor-vehicle manufacture, while the paper and printing trades have developed on an enormous scale. The six mineral products of greatest value commercially are petroleum, coal (bituminous and Pennsylvania anthracite), pig-iron, cement, natural-gas, and copper. The United States is also the chief source of the world's zinc and lead. Pennsylvania is by far the most important mineral-producing state.

Banking and Finance.—Banks issuing paper money existed in colonial days. In 1791 the First Bank of the United States was granted a twenty-years' charter; it was succeeded in 1816 by the Second Bank of the United States, which was wound up in 1832. Meanwhile numerous state banks sprang up, and by 1860 there were some 1600 banks all issuing their own notes. There was nominally a specie currency, but bimetallic difficulties had rendered it negligible. From 1846 the government carried on its own banking under the independent treasury system and did something to steady the financial system which had so far been a record of over-speculation, inflation, and crisis. At the beginning of the Civil War the government issued the famous inconvertible notes called Greenbacks (q.v.) and brought about serious inflation, though a steadying step was taken in 1863, when note-issue was made a concern of national banks only; the system, however, became more and more inelastic, and the notes gradually disappeared from circulation. Meanwhile there had been a prolonged remonetisation of silver, but a severe crisis in 1893 called for a revision of the currency laws, and the gold standard was adopted in 1900. In 1907, however, another panic occurred and the banking system was again criticised, the outcome of investigations being the establishment of the Federal Reserve system in 1914. The whole country is divided into twelve districts, each served by a Federal Reserve bank. The banks are situated in the cities of Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St Louis, Minneapolis, Kansas City, Dallas, and San Francisco. Central control is exercised by the Federal Reserve board situated at Washington. The Federal Reserve banks do not undertake ordinary banking business with the public, but with the member banks, thus constituting 'bankers' banks.' All national banks are members of the Federal Reserve, while State banks are encouraged to join; in all, about two-thirds of the banking resources of the country are connected with the system. The strength of the new régime was severely tested in the World War and in the economic crisis of 1920. Inflation took place to a large extent, but it is certain that its worst consequences were less severe than they would have been under earlier financial machinery. The Federal Reserve acted as the centre of the great financial schemes during the war, e.g. the raising of loans, and the granting of loans to allies. The national debt reached the figure of 26,000 million dollars in 1919. The sum raised by the 'liberty' and 'victory' loans was over 20,000 million dollars, while some 10,000 million dollars were loaned to the allies of the United States. Debt-funding arrangements, covering about 97 per cent. of the total original obligations, have been arranged with practically all of the countries involved. Taxation met a great part of the war expenses, a progressive income-tax having been imposed in 1913, previous to which customs and excise duties had been the chief source of revenue. See SAVINGS-BANKS.

See the articles on Bimetallism, Canal, Census, Cotton, Iron and Steel, National Debt, Patents, Pensions, Protection, Railways, Shipping, Sugar, Telegraph, Timber, Tobacco, Wheat, Vine, Wool, &c.; the United States Census Reports; the annual *Statistical Abstract of the United States*, and the other exceptionally copious reports of the Statistical Bureau in Washington; the publications of the American Academy of Political Science, the Johns Hopkins University Studies in Historical and Political Science, *The World Almanac and Book of Facts* (annual; N.Y.), as well as innumerable annual handbooks, and economic historical text-books by Bogart, Van Metre, Carver, and Jennings, where more detailed bibliographical references are to be found.

NAVY AND ARMY.

Naval expenditure in the United States gradually increased from 16 million dollars in 1885 to nearly 2000 million dollars in 1919. Consequent upon the Washington Treaty Limiting Naval Armaments (1923; see WASHINGTON), 28 capital ships were dismantled and 4 diverted to other purposes. The navy now consists of 342 first-line ships (18 battleships, 10 light-cruisers, 267 destroyers, 47 submarines), and 22 of the second-line (11 cruisers and 11 light-cruisers), 230 airplanes, besides aircraft-carriers, mine-layers, submarine-chasers, gunboats, mine-sweepers, hospital-ships, &c. The personnel

consists of 8300 officers and 86,000 men. The marine corps number 1000 officers and 27,000 men.

The United States army, according to an act of Congress in 1920, consists of the Regular Army, the National Guard while in the service of the United States, and the Organised Reserves. The enlisted strength of the regular army is about 132,000, including 12,000 officers, and some 7000 Philippine Scouts. The National Guard is the organised militia of the various states, and is aided financially and in the matter of arms, equipment, &c., by the national government. It may be called into the service of the United States when troops in excess of the number of the regular army are required. Its strength is about 175,000. The Organised Reserves are a further reserve force, including the Officers' Reserve Corps (104,000) and the Enlisted Reserve Corps (5000).

For territories and dependencies see separate articles, ALASKA, HAWAII, PHILIPPINES, PORTO RICO, &c.

HISTORY.

England claimed the greater part of North America by right of the discovery of John Cabot in the summer of 1497. The first permanent settlements, however, were made by the Spaniards in Florida, and by the French on the banks of the St Lawrence. The later half of the 16th century witnessed a great and sudden expansion of England's sea-power. The defeat of the Armada made the seas vastly safer for the navigator, and rendered improbable another Spanish attack like that of Menendez (1565) on the French Huguenots in Florida. A sudden plunge into speculative ventures brought disaster in its train, and it is to this commercial distress of the early years of the 17th century that the planting of the first permanent English colony was due. Sir Walter Raleigh (q.v.) sent out colonies in Elizabeth's time, but the name Virginia is all that remains to remind us of his vast schemes. In 1603 his rights reverted to the crown, and in 1606 the Virginia Company was chartered to make good England's claims to the American land. Virginia, as defined in this charter, extended from 34° to 45° N. lat. Two sub-companies were provided—one, with headquarters at Plymouth, to settle the northern part; the other, with an official residence at London, to settle the southern portion. In April 1607 the London company founded the first permanent English colony at Jamestown, on the James River, near Chesapeake Bay. The English were then only learning the art of colonisation, and a great many of those who came to Virginia during the first half-dozen years of its existence starved to death. But others took their place, and the success of the plantations was ere long assured, chiefly owing to the rapid spread of the tobacco habit; in 1619 Virginia was already able to export twenty thousand pounds of tobacco. The early colonists were men, but the company encouraged the immigration of marriageable girls, and soon the settlers were bound to the soil by ties of family responsibility. Labour was still scarce, but in 1619 that problem was solved, for the time at least, by the introduction of negro slavery; though as a commercial venture the company was a complete failure. In 1619 the London company inaugurated a new era by granting a modified form of self-government to the colonists.

The next permanent settlement was made farther north by a band of honest, religious folk, who brought their wives and children with them. Some of them had passed a few years in the Netherlands, and they all are usually known as the Pilgrims (see PILGRIM FATHERS). They settled in 1620 on the shores of a wretched tidal harbour which was called Plymouth (q.v.). Ten years later the colony of Massachusetts (q.v.) was founded by the English Puritans, to provide an asylum for themselves and their friends in the event of the struggle in England going against them. The council for New England, as the successor to the Plymouth branch of the Virginia Company was called, gave them a grant of land, which the king confirmed, whilst giving them in addition very extensive powers of government. For ten years (1630–40) a constant stream of immigrants poured into New England. It could hardly be expected that all these Puritans should think alike. Some of them, regarding Massachusetts as too liberal, settled at New Haven; while others, thinking it not liberal enough, founded the colony of Connecticut (q.v.). In 1662 Charles II. granted a charter to the people of Connecticut, including the New Haven colony. Other Puritans, whom the Massachusetts people did not like, settled Providence and the island of Rhode Island (q.v.); and these settlements were united and incorporated by charter in 1663 (see WILLIAMS, ROGER). The two last-named charters gave, in effect, self-government to the people of the two colonies. They were so liberal that the Connecticut charter remained the fundamental law of Connecticut till 1818, while the Rhode Island charter was not superseded by a state constitution until 1842. Other settlements were made by Puritans and others along the Merrimac River and the seaboard north of Massachusetts. The former were known as New Hampshire. The latter were within the province of Maine, and the rights of the original grantees were purchased by Massachusetts in 1677. Maine remained under the government of Massachusetts

Appropriation of North America by Europeans in 17th century.

until 1820. In 1643 four of these colonies, Massachusetts, New Plymouth, Connecticut, and New Haven, joined together for mutual convenience and defence, under the name of the United Colonies of New England.

In 1624 the Virginia charter, by one of those arbitrary acts common during the Stuart period, was annulled, and the colony thus became a royal province. Little change seems to have been made in the government of the province, but one king after another granted away land which had been included within its charter limits. The first of these grants in point of time was made by Charles I. to his former secretary, George Calvert, first Lord Baltimore, who was a Roman Catholic. Before the patent was actually issued George Calvert died, and it was issued to his son Cecil, Lord Baltimore (see MARYLAND). Calvert's design seems to have been to found a landed estate for his family and an asylum for his fellow Roman Catholics. In both these designs he was successful, and the Baltimore family derived revenue from the province until the time of the American revolution. A toleration act for Maryland, the first in the history of the English race, was passed in 1650 by an assembly composed of both Protestants and Catholics.

During the great Civil War and Commonwealth periods immigration into the Puritan colonies almost ceased; indeed, at times the movement seems to have been the other way. Beyond requiring an acknowledgment of allegiance and obedience to the navigation ordinances, the Puritan rulers of England left the colonies to themselves, and for some half-dozen years all the colonies enjoyed self-government.

With the restoration of the Stuarts there came a revival of the colonising spirit. In 1663 Charles II. granted to Clarendon and other courtiers a vast tract lying south of the settled portions of Virginia, under the name of Carolina. The grantees attempted to introduce a fantastic form of feudalism (see NORTH CAROLINA), but the colonists would have none of it. Early in the 18th century the

crown purchased the rights of all but one of the grantees, and assumed the government of the whole, the province being divided (1729) into two governments, North Carolina and South Carolina. South Carolina soon became very prosperous, her rice supplanting that of Egypt in many markets of Europe.

The government of the Restoration adopted the colonial policy of its predecessors, and restricted colonial trade as much as possible to England and to subjects of the English crown; thus, certain goods could be exported only to England in English or colonial ships. The country bordering on the Hudson and Delaware rivers had been settled by the Dutch and Swedes, and was now in the hands of the Dutch. It was impossible to enforce these navigation laws under the circumstances, and the conquest of the Dutch colonies was resolved on and accomplished in 1664—though for a few years they again came under Dutch control. They were finally surrendered to England in 1674. Even before the conquest Charles II. granted these Dutch colonies to his brother James, Duke of York and Albany; and James, with the Stuart love of giving, re-leased a valuable portion of it to two of his friends, Berkeley and Carteret, who were also among the grantees of Carolina. In honour of James, the Dutch settlements, when conquered, were called New York; while in commemoration of the fact that Carteret had held the island of Jersey for the Stuarts during the Civil War the portion given to him and Berkeley (1664) was called New Jersey. In 1674 these grants were renewed. New York was thus a conquered province, and the people there had none of the privileges enjoyed by the people of the colonies which had been originally colonised by Englishmen.

The governors of New York, sensible of the grave error of the grant of New Jersey, placed all possible obstacles in the way of the grantees, and before long the property came into the hands of a syndicate of Quakers, at the head of which was William Penn. Trouble continued with New York, and the Quakers became involved in innumerable disputes about land and matters of local government. To avoid further complications the jurisdiction was surrendered to Queen Anne (1702). For a time New York and New Jersey had the same governor, though separate legislatures. In 1738 a governor was appointed for New Jersey, and thus it became a separate colony, remaining so until the revolution. William Penn does not seem to have been disturbed by the disputes of the New Jersey Quakers. He obtained from the king, in 1682, a large tract of land on the west side of Delaware, under the name of Pennsylvania (see PENN). He also obtained from the king and the Duke of York the Swedish-Dutch settlements on the western side of Delaware Bay, south of Pennsylvania. There was a long and bitter dispute between Penn and his heirs and the Baltimores as to the boundary between their possessions. A compromise was made in the middle of the 18th century, the present boundary line being run for some distance by two English surveyors, Mason and Dixon (see MASON AND DIXON'S LINE). For a century this line, known by their names, was regarded as the boundary between the north and the south. As the matter was finally determined in 1703, Pennsylvania and the lower counties on Delaware Bay had each its own legislature, but one governor. At the revolution, however, the counties set up for themselves as the state of Delaware.

The last colony to be planted was Georgia (1732). It had its origin in the philanthropic instincts of Oglethorpe, and the desire of the English government to push the southern boundary against the Spaniards. The philanthropists, however, were not good governors; one by one their schemes failed, and in 1751 they voluntarily surrendered the colony to the crown.

Toward the end of the Stuart period a scheme of colonial consolidation was set on foot. The idea seems to have been to form two or three strong colonies, governed directly from England, out of

the thirteen free, weak, self-governing colonies. Charters were annulled, and all the colonies north of 41° N. lat. were formed into the dominion of New England, with a capital at Boston. In 1686 Andros was appointed governor, with executive, judicial, and legislative powers, the people no longer having any political power. But the arrangement did not long continue; on the news of the landing of William of Orange at Torbay the people of Boston rebelled, captured Andros and other officials, and sent them to England for trial. Rebellions occurred also in New York (Leisler's rebellion) and in Maryland (Coode's Association).

The new English government adopted a policy of compromise. The old forms of government were generally restored, except in Massachusetts; but as an offset to these concessions the trade of the colonies was still further restricted to England. Massachusetts, which now included Plymouth, was given a modified charter government. Under this new charter the governor was to be appointed by the crown, the House of Representatives elected by the people on a property qualification, and the council appointed by the two jointly. But colonial laws were subject to the veto of the home privy council, while admiralty jurisdiction was also reserved to the crown, who consistently pursued the mercantilist policy of trade regulation. Navigation acts had been passed in 1651 and 1663, while a new one in 1696 subjected the colonial governors to royal approval, and re-organised the customs system, allowing officials to be placed anywhere in the colonies.

The colonies shared in the good and evil fortunes of England in the great struggle with France, which began in 1690 and continued until 1763. The earlier conflicts have little interest at the present time. But in 1745 the New Englanders, with some slight assistance from the English, besieged and captured Louisburg, on Cape Breton Island. At the close of the war, however, Louisburg was given up to France, much to the colonists' displeasure. In 1754 trouble began anew; the French endeavoured to connect their possessions in the St Lawrence valley with their settlements on the Mississippi by a chain of posts and towns on the Ohio River and its affluents. This brought France into contact with Pennsylvania and Virginia. The governor of Virginia at that time was a Scot named Dinwiddie. He sent a formal protest against the French occupation of Fort Duquesne, at the confluence of the Monongahela and Alleghany rivers. The French paying no regard to this protest, Dinwiddie attempted to drive them out by force; but the campaign ended in disaster, Washington, the Virginia commander, and his little army being obliged to surrender at Fort Necessity. The war begun in this way soon spread over the whole frontier, and before long nearly all the nations of western Europe became involved in the struggle. In 1755, after the failure of an attempt to get the colonies to act in concert, General Braddock was defeated near Fort Duquesne by the French and their Indian allies, and other reverses followed. Later, though, when Pitt had appointed new generals, the fortune of war changed. In 1758, after serious resistance, Louisburg was again taken from the French, this time by an English army commanded by Amherst and Wolfe. The next year Wolfe, with a strong fleet and army, sailed up the St Lawrence, and after a long investment placed his army on the Plains of Abraham, on the northern side of Quebec, just outside the walls, and there defeated the French under Montcalm. Both Wolfe and Montcalm were mortally wounded during the action. By this time the English had penetrated by the line of Hudson River, and in 1760 captured Montreal, and thus secured the safety of Quebec. In 1763, by the peace of Paris, France gave up Canada and all her claims to lands east of Mississippi and north of Florida to England, with the exception of some small islands in the Gulf of St Lawrence and the district of New Orleans at the mouth of the Mississippi. At the same time she ceded to Spain, as the price of her unavailing assistance in the war, all her claims to lands west of the Mississippi, and to New Orleans with the surrounding district. Spain ceded to England all her claims to lands east of the Mississippi, with the exception of New Orleans; and England, on her side, restored what she had conquered in the West Indies to France and Spain, and relinquished whatever claims she might have had to lands west of the Mississippi. By a proclamation issued in the same year the king still further restricted the limits of those colonies by a line drawn along the Appalachian divide. West of this line was to be Indian territory, and the colonists were annoyed by this curbing of their desire for expansion. Meanwhile an Indian rebellion, led by Pontiac (q.v.), in 1763, convinced the English government of the necessity of keeping on foot in the colonies a force of regular troops. It seemed right that the colonists should bear a part of the burden their support entailed; and by act of parliament, therefore, a stamp-tax was laid on all the American colonies (1765). The tax was equitable enough, and it was fair that the colonists should bear a part of the burden of their protection. It did not seem right, however, that they should be taxed by an assembly 3000 miles away, in whose election they had had no voice, and whose members were not in any way responsible to them. Moreover, now that the French menace was permanently removed, they could afford to dispute their allegiance to the imperial government. At about the same time parliament also amended the trade laws (especially in relation to the molasses trade) in the direction of efficiency and simplicity, making them easier of enforcement. The points in dispute are illustrated by the arguments of James Otis of Massachusetts against Writs of Assistance (warrants authorising the holders to search for smuggled goods), and of Patrick Henry of Virginia on the legality of the king's veto of an act of the Virginia Assembly. Neither had any law whatever on his side; they based their arguments on the broad rights of the colonists as men and subjects of the English crown. Resolutions embodying the same ideas were passed by the Virginia Assembly during the Stamp Act troubles and at Henry's suggestion. So general was the opposition to the act that when the day arrived on which it was to go into operation not a stamp could be anywhere purchased. The judges even were obliged to proceed without stamps, and the customs officers to give clearances which were unlawful on their very faces. There was a change of government in England at this time, owing to the king's dislike of George Grenville, and the Rockingham Whigs came into office. Partly to discredit their predecessors, partly to conciliate Pitt (the elder), and partly because they could not help it, the Stamp Act was repealed. Pitt had a whimsical notion that parliament, though unable to levy direct taxes on the colonies, possessed nevertheless complete legislative power, and a declaratory act to that effect was passed. The colonists soon saw the futility of this distinction, and opposed the Townshend duties on glass, tea, and paints imported into the colonies. Finally, when an attempt was made to force the tea upon them, they threw it overboard or stored it in damp cellars. Parliament then suspended the charter of

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Massachusetts, and closed the port of Boston (q.v.). Thereupon the other colonies took up the cause of Boston and Massachusetts.

The contest was really for self-government for America; the Americans maintaining that they were the equals of Englishmen living in England—not their subjects. The colonies had steadily been developing economically and politically. By 1760 the balance of power in the colonial governments had shifted from the executive (governor and council) to the elective assembly. When the struggle began the strength of the colonial assemblies was put to the test. The colonists said they were not and could not be adequately represented in parliament, and hence could not be bound by its votes; the colonial assemblies represented them. These and other reasons for taking up arms were embodied in a Declaration of Independence, July 4, 1776, which was in reality the platform of the Radical party. The English view, on the other hand, was that parliament was the supreme legislative body of the whole empire, while the colonial assemblies were merely subordinate legislatures.

The contest began with the skirmishes at Lexington and Concord on April 19, 1775, followed by the battle of Bunker Hill on 17th June of the same year. From that time until March 1776 the English army was blockaded in Boston by the New England farmers, before long headed by Washington (q.v.). Finally, however, the English were obliged to evacuate Boston, and the war drifted away from New England. The British plan was to conquer and occupy important towns like New York and Philadelphia. Washington's idea, on the contrary, was to preserve his army. This he accomplished in a manner to arouse the admiration of the world. The capture of a Hessian detachment at Trenton, New Jersey, in December 1776, saved the revolution from ignominious failure, and was the turning-point of the war. The next year Howe captured Philadelphia, retaining control of New York City and the lower Hudson. Washington was obliged to retire inland to a strong position among the hills named Valley Forge. In 1777 General Burgoyne attempted to seize the line of the Hudson River, marching southward from Canada. From a military point of view this plan was an admirable one, but it left out of account the unanimous resistance of the inhabitants of New England and the people of northern New York. Burgoyne's advance was delayed in every possible way, and by the time he reached Saratoga his light troops had been destroyed at Oriskany in western New York and at Bennington in Vermont. Surrounded by the farmers of New England and New York, unable to go forward or to go backward, he surrendered, October 19, 1777.

The French, now convinced that the colonies could hold their own, entered into an alliance with them in 1778. This led to the evacuation of Philadelphia, which had been captured, and in 1780 Clinton with a strong army sailed southward from New York, landed on the South Carolina coast near Beaufort, besieged Charleston on the land side, captured it, and overran the seaboard. He then returned north, leaving Cornwallis to continue the subjugation of the south. An army sent by Washington to oppose him was defeated at the battle near Camden in the same year, the commander of the Americans being the same Horatio Gates who had commanded the Americans during the Saratoga campaign. In the autumn of the same year, however, General Nathanael Greene took command of the American resistance to Cornwallis. In October 1780 the English irregular troops were routed at King's Mountain by the frontiersmen of Kentucky and Tennessee. In January 1781 Greene's lieutenant, Daniel Morgan, severely defeated Cornwallis' light troops, under Tarleton, at the Cowpens, and escaped with his prisoners. Cornwallis then pursued Greene across North Carolina to the Virginia line, but on March 15 Greene and Cornwallis fought a bloody battle at Guildford Court-house, after which, though Greene was defeated, Cornwallis had to leave his sick and wounded to the care of the Americans and repair to Wilmington on the seaboard. Greene, after following him for some distance, marched to South Carolina, and in two campaigns cleared the interior of that state and of Georgia of English troops. Unsuccessful as he was at Guildford Court-house, nevertheless Greene won the southern campaign. Cornwallis from Wilmington marched northward into Virginia, and fortified a strong position on the York River at Yorktown.

Clinton, called back from his southern conquest by the arrival of a French fleet and army at Newport, accomplished little except to hold that army at Newport. In 1781, however, a strong French fleet under Comte de Grasse came north, bringing with him another strong French force. Washington and Rochambeau, the French commander, had agreed to co-operate with De Grasse, and a few days after De Grasse's arrival at the Chesapeake the allied army reached the head of that bay, and before long closely besieged Cornwallis at Yorktown, De Grasse with his fleet preventing reinforcements reaching Cornwallis from New York. He surrendered on October 19, 1781. This ended the contest. In England the Whigs again came into power, and in November 1782 preliminaries of peace were concluded at Paris, although a definitive treaty was not signed until a year later.

The colonists were then living under a constitution known as the Articles of Confederation. The government of this confederation could exert no pressure on individuals; it dealt only with the states, and was at their mercy. This marks the farthest limit of the particularist movement. The old western boundary of the colonies had been the Alleghanies; but the United States by the treaty of 1783 acquired all the land to the Mississippi. Did this land belong to the nation as a whole, or to the states to whom the king might at one time have granted it when they were colonies? The whole future of the country rested on the decision of this question. If the management of this splendid domain was undertaken by the United States as a whole, nationality and union were inevitable. In the end, the states claiming these lands gave them to the United States. In 1787 congress passed an ordinance for the government of the territory north-west of the Ohio obtained by this cession. By this it was provided that the settlers of this territory should possess all the rights of the people of the older states, and should have and exercise self-government as soon and to as great an extent as convenience permitted. As soon as any portion of this territory should have a population of sixty thousand it might be admitted to the Union on the same terms as the older thirteen states. These new states were to be admitted as of right to a position of equality with the older states. Thus, for the first time in the world's history, a nation resolved to treat its colonists on equitable terms, giving to them the rights it had claimed for itself. As territory after territory was acquired by the United States the same principles of right were applied, and now the United States comprises forty-eight equal co-ordinate states, living peaceably together as one nation.

But the transition period brought many new problems. There were difficulties of commerce and finance; discontent, in Massachusetts especially,

was rife. The Articles of Confederation were clearly inadequate. A convention of leading men held at Philadelphia in 1787, drew up a constitution. After much opposition it was ratified, and went into force in 1789, and is still the organic law of the United States. The constitution has lived long and worked well because it is based on the experience of the thirteen colonies in self-government, and is elastic enough to be able to adapt itself to changed conditions to almost any extent. It is elastic because the expressions used to define the powers granted by the people to the central government are so vague that their meaning really depends on the decision of the Supreme Court; and experience has shown that that court will ultimately interpret the constitution as the people wish. In addition, the constitution contains a provision for its own amendment; but the process is very cumbersome, and, as a matter of fact, out of many hundreds of amendments formally proposed only nineteen have been adopted.

A contest between the large states which wished apportionment based on population and the small states which wished the states to have an equal vote ended in a compromise, by which each state has an equal vote in the Senate, while representation in the House of Representatives is based on population. The House is newly chosen every second year, while only one-third of the Senate is changed each second year. It thus may take six years to change the majority in the latter body. The senators were chosen by the state legislatures until 1913; since then they have been elected by direct popular vote. The representatives are similarly chosen, i.e. by the direct vote of those who have the right to vote for the members of the lower house of the state legislature. The House has control of money bills, while the Senate acts in many ways as an advisory council to the president. These arrangements have resulted in the preservation of state lines and local self-government, and also in the representation of wealth and position on the one hand, and of the mass of the people on the other. Furthermore, the House yields readily to the popular will, while the Senate remains firm for a sufficient length of time to allow the people to think the matter over. If the people wish anything for four or six years, the majority of the Senate will change to conform to the will of the majority of the people. The president is elected for an intermediate period of four years. In this way it often happens that the president and one House will be on one side of a question, the other House being on the other. So far all these things have made for stability.

The provision of the constitution which has attracted most attention is that providing for a supreme court, composed of judges who hold office during good behaviour, and whose salaries cannot be diminished while in office. The jurisdiction of this court is almost all appellate. It has almost no dealings with the other branches of the government. If a case involving the constitutionality of a law comes before it, it decides the matter, and if the act is declared to be unconstitutional the federal courts will not enforce it. The Supreme Court can also by writ bring before it any decision of a state court denying the validity of a federal law.

George Washington was unanimously elected first president, with John Adams as vice-president. The American Revolution is ordinarily regarded as ending in 1783. But a far greater revolution than the overturning of the power of England and the substitution of a federative form of government now took place. American society in 1789 was essentially aristocratic, and so were politics. In every state there was a property qualification, and, as the right to vote for national officers depended on the right to vote for state officers, it followed that only those possessing property could vote for national officers. And so with everything else, American society and institutions were still essentially English. But the opening up of new countries beyond the Alleghanies, the feeling of independence to which the cutting loose from England gave rise, and, above all, the confidence in the future which the new government inspired, all combined to turn the thoughts of the people toward greater rights for the individual.

This great movement was led by Thomas Jefferson, the Secretary of State, who as far back as 1774 had asserted that governments are founded on truth and justice, and on the rights of men. Jefferson now proposed to give practical effect to these views of the early revolutionary period, and to found, in fact, a government by the people, of the people, and for the people, based on truth, justice, and confidence. At the other extreme was Alexander Hamilton, Secretary of the Treasury, who distrusted men in the mass, looked on them as reasoning not reasonable beings, and wished to found a strong national government to which all of what seemed to him the stronger elements in society should turn. For the time being Hamilton and the Federalists were in the ascendant, Jefferson and the Anti-Federalists being discredited by their opposition to the constitution. There was nothing incompatible between nationalism and democracy. Indeed a strong government based on democracy was and is the only possible government in the United States. But Hamilton was not broad enough to see this, and Jefferson was perforce obliged to use the opposition or particularist party as his ally.

In order to attach the moneyed classes to the national government Hamilton and the Federalists introduced scheme after scheme for the advantage of capital. A protective tariff bound the manufacturers to the central government, while a United States bank bound moneyed interests to it; the funding of the debt and the assumption of the state debts created a large national debt, enriched the speculative classes, and bound the holders of the debt to the central government. For the rest, Hamilton and the Federalists organised the working departments of the government essentially as they exist to-day.

Probably no other man could have given the new government so good a start as Washington. His very presence at its head gave to it a dignity and stability which only years of successful administration could otherwise have secured. Washington saw clearly that his most useful work would be to give the country a strong, quiet government, thus gaining time for the constitution to acquire a place in the hearts and traditions of the people. Therefore he endeavoured to keep the country out of all foreign complications, while at the same time he secured the navigation of the Mississippi from Spain, and commercial privileges from England. The French Revolution, however, forced him, as well as other rulers, to take sides.

Like Charles James Fox and other liberal-minded Englishmen, Jefferson sympathised warmly with the ideas and aims of the early leaders of the French Revolution, and underestimated the fickleness and instability of the French people. When the Revolution assumed its propagandist character, and war with England followed, the revolutionists expected to gain sympathy and assistance from the Americans, whom they persisted in regarding as owing France a debt of gratitude for aid in the American Revolution—the fact being that France had then used America as a cat's-paw, and had deserted her at the time of negotiations for peace. The sympathies of the people were with France, but it was a question which divided parties as to

how far this feeling should guide the country's policy. Washington decided that the only safe policy for the new nation was one of strict neutrality, and time has justified his conclusion. But Jefferson retired in disgust from the government, and the Federalists soon obtained full control. At the end of his second term Washington declined re-election, and John Adams was chosen president. He inherited not only Washington's policy but his official advisers, who looked to Hamilton, though he was no longer in the cabinet, as the head of the party. Washington's firm hand withdrawn, the country rapidly drifted toward war with France, whose government insulted the Americans by demanding money as the price of peace. A provisional army was set on foot with Washington at its head. But an opening presenting itself, Adams renewed negotiations for peace, and Napoleon, now at the head of the French government, concluded them. This was perhaps the most high-minded and patriotic act of John Adams' whole career; but it lost him the support of his party.

Among the acts of the Federalist majority at this period were the Alien and Sedition Laws, giving the government for a limited period power to deal with foreigners resident in the country, and with those who publicly opposed the acts of the government. It happened that most of the Republican (q.v.) or Jeffersonian journalists were foreigners, and the Republicans, declaring these acts aimed against themselves and their friends, caused the legislatures of Kentucky and Virginia to pass resolutions setting forth the particularist theories as opposed to the nationalist theory of the Federalists. But there the matter rested.

In the election of 1800 the nominees of the Republican party obtained the majority of the electoral vote. Each elector then voted for two persons without specifying which was his choice for president, and Jefferson and Burr had an equal number of votes. No man ever doubted that Jefferson was the person intended to be president. It became the duty of the House of Representatives, in which the Federalists had a majority, to designate which should be president. In their desperation and hatred of Jefferson they determined to elect Burr. In this they failed; but by thus attempting to thwart the will of the people the Federalist party lost the confidence of the people and sank into comparative insignificance. The contest also resulted in an amendment of the constitution, empowering the electors to vote for one man as president and another man as vice-president. Jefferson once in power outlined a policy of economy and reform. He immediately did away with the ceremonial of official intercourse which had meant so much to Washington and Adams. The one great accomplishment of his two administrations was the purchase of Louisiana, or the western part of the basin of the Mississippi, from France (1803) for about 15 million dollars. This purchase was plainly not authorised by the constitution; and, indeed, for a time Jefferson thought an amendment would be necessary. In 1812 the southern end of this great acquisition was admitted to the Union as the state of Louisiana.

With the renewal of the war between England and France in 1803 came a renewal of the troubles of the United States, now the only neutral nation possessing ships. In the course of time England declared the ports of western Europe blockaded, while Napoleon on his side issued decrees declaring the ports of the Continent closed to English ships and produce, and to ships which had touched at English ports (see CONTINENTAL SYSTEM). To these restrictions Jefferson opposed only counter restrictions, so that the carrying trade was attacked from three directions at once. Portions of the country were ruined, and Jefferson closed his second term, by abdication in 1809, amid difficulties of the most serious kind at home and abroad.

James Madison of Virginia, long Jefferson's right-hand man, succeeded him, and was re-elected in 1812. The irritation against the foreigners now increased rather than diminished. With England there was still another cause of dissatisfaction. England claimed and exercised the right to search American vessels for deserters from the English navy and for other British subjects. There were without doubt many deserters, but the right of search was founded on a wrong principle, and besides it was impossible to distinguish between an American and an Englishman. Thousands of Americans were seized and forced to fight for England. Congress was now in the control of a party eager for war with England, and war was begun in 1812. The Americans attempted to invade Canada by the line of Lake Champlain and of the St Lawrence valley, and were driven back. On the water, however, the Americans were almost uniformly successful, the frigates *Constitution*, *President*, and *United States* capturing English vessels of their own class. On the other hand, an English ship, the *Shannon*, captured the American frigate *Chesapeake* off the harbour of Boston. In August 1814 the British captured the city of Washington, burned and destroyed the public buildings there, and attacked the city of Baltimore, but were driven back. In December 1814 this war was concluded by the treaty of Ghent, which was signed twenty-five days before General Jackson repelled a most gallant attack of the British on New Orleans. No mention was made of the right of search, or of impressment in the treaty, but they were given up. On the whole, this 'Second War of Independence' was a good thing for the United States, as it made strongly for nationality, and convinced even the most ardent friend of England of the undesirability of an English connection.

Madison's successor was James Monroe, another Virginian, of moderate abilities, but well fitted to lead the country at a time of complete cessation of party strife, known as the 'era of good feeling.' In 1819 the United States acquired East and West Florida, or all of Spanish America east of the Mississippi, at the same time abandoning whatever claims she had to Texas, California, and New Mexico. Monroe's name is also associated with the formal announcement to foreign powers of the American idea of the separation of American and European politics. This was not a new idea in any sense, but the first complete enunciation of it was by Monroe, and it is hence known as the 'Monroe Doctrine' (see MONROE).

With the end of Monroe's administration came an end to the good feeling. The Democratic party became split into factions, each following a leader, John Quincy Adams, Jackson, Clay, Crawford, or Calhoun. No one received a majority of the electoral vote, though Jackson headed the poll. Nevertheless the friends of Adams and Clay in congress united and elected Adams, who now appointed Clay Secretary of State; and charges of corrupt bargains between 'the Puritan and the Blackleg' were freely made. There is no evidence of corruption, and the House of Representatives had a perfect right to elect Adams; nevertheless he began his term of office under many disadvantages. This was the period of the so-called American system of a high protective tariff, combined with internal improvements, such as the Chesapeake and Ohio Canal, begun at this time. Adams, who was cold and conscientious, refused to use the federal patronage to build up a party devoted to his interests. On the other hand,

General Jackson was the idol of a majority of the people. He promised to give a good office to any one who should work for his interests; and in 1828 he was elected president by a vast majority. With the exception of the introduction of the 'spoils system' there is much to be admired in Jackson. He stood for the nation against the state, as in the case of Nullification (q.v.); for the people against the moneyed classes, as in the case of the United States Bank; for the country as against foreign aggression, as in the case of France. During Jackson's time the steam-locomotive was introduced into America, one thousand miles of railroad were built in five years, and American life began to show its tremendous expanding powers.

After Jackson there came a succession of presidents whose names are scarcely worth remembrance. The interest now turns slowly but surely toward the struggle between the North and the South, which led ultimately to war, and to the destruction of the 'Old South.' The sole cause of this divergence was negro slavery, or better perhaps the belief that the cultivation of cotton required unfree black labour. Slavery had existed in all the original thirteen states from the early times. In the North it was not profitable, except in one or two places, and was dying out in 1780. In the South, by which is meant the country south of Mason and Dixon's line, slavery had not been of very much account, except in South Carolina and Georgia, where the malarial rice swamps seemed to require negro labour. The Virginia leaders were against slavery, and expected to see it disappear in the South as it was disappearing in the North. It was unfortunate that the constitutional convention of 1787 did not hold out on these points, and provide for the extinction of slavery whenever the majority of the people of the whole country desired. But what seems plain now was not plain then; slavery was favoured in the constitution, and the slave-owner given more than his proportion of the representation in the House of Representatives. In 1794 Eli Whitney discovered a way by which the cotton fibre and seed could be separated by machinery. This alone made the cultivation of cotton on a large scale profitable, and, combined with great inventions in the art of spinning and weaving in England, enormously stimulated its production, and negro slavery was fastened on the country. As time went on the North became a great manufacturing as well as an agricultural country; cities multiplied, population became denser, and the whole mode of life of pre-revolutionary days underwent a complete and radical change. In the South the old life was in many ways intensified. The two sections thus grew apart.

At first the South, and South Carolina most of all, was very nationalistic. But as time went on and a protective tariff was framed to stimulate manufactures, the South turned completely round. It had no manufactures, and would receive no benefit from this tariff, and many things would be increased in price. It was therefore proposed, somewhat in line with the views of the early Republicans and of the New Englanders during the war of 1812 (see HARTFORD CONVENTION), to nullify the disliked law so far as South Carolina was concerned. Jackson, who was then president, met this issue squarely, and an act authorising him to use force was passed. The nullification was suspended, and the whole matter was compromised.

The ordinance of 1787 prohibited slavery in the new territory north of the Ohio, and as states came into existence there this prohibition was carried out, slavery being the custom in the territories and states south of that river. When Louisiana was bought a new element at once came in. Slavery existed in the regions around New Orleans and St Louis. Louisiana and the country around New Orleans was admitted as a slave state in 1812. But when Missouri or the country dependent on St Louis applied for admission, the case was somewhat different. Finally a compromise was made to the effect that Missouri should be a slave state, but the remainder of the Louisiana purchase north of its southern boundary (36° 30′) should be forever free. This was the Missouri Compromise of 1820, and for twenty years it postponed the inevitable conflict.

The United States had acquired by the Louisiana purchase some vague claim to that territory lying between the Sabine, Rio Grande, and Arkansas rivers. This territory, or at all events a portion of it, was known as Texas, and was sparsely settled, mainly by adventurers from the southern states; but slavery was not allowed there by the constitution of Mexico. In 1836 Texas revolted from Mexico, and established a republic. The South cast longing eyes on Texas—the Texans to a great extent were their own folk, and their country would add to the territory suited to slavery. In 1845 Texas was annexed or re-annexed to the United States, and admitted as a state. A dispute with Mexico at once arose as to its western boundary. General Zachary Taylor was ordered to seize the territory in dispute, and war with Mexico followed. In May 1846 he crossed the Rio Grande, and won the battle of Buena Vista. Frémont and others seized and held during the war the country on the Pacific slope now known as the state of California, to which the United States had no claim whatever. In March 1847 General Scott landed on the Mexican coast near Vera Cruz, captured that fortified seaport, and placed his army on the high lands toward the interior. In the autumn he marched towards the city of Mexico, defeating the Mexicans under Santa-Ana in battle after battle, the most important being Cherubusco and Chapultepec, and capturing the city of Mexico. By the treaty of Guadalupe Hidalgo (1848) this war was ended, Mexico ceding to the United States all that the latter had claimed or had seized, comprising the southern and western portion of the state of Texas, New Mexico (then including Arizona), and California. The United States agreed to pay Mexico over fifteen million dollars, and to pay in addition about three million dollars due from Mexico to citizens of the United States. In 1853 this acquisition was rounded out by the 'Gadsden Purchase' of a small strip on the south-western line. The North was in part compensated for this great increase of probable slave territory by the acquisition of that part of Oregon lying south of the 49th parallel, to which the United States had various claims. It was decided to let the people of each portion of the territory acquired from Mexico settle the question of slavery for themselves: this was called 'squatter sovereignty,' though the phrase may not have come into common use until about 1854. In 1850 California, to which the discovery of gold had attracted a rush of immigrants, was admitted as a non-slave state. To pacify the South, the Fugitive Slave Law (q.v.) was passed, which directed the Federal authorities to return slaves who had escaped to the North. The execution of this act strongly aroused the people of the North to the gross evils of slavery, and the abolitionists, who had been in existence since 1830, began rapidly to make converts.

In 1854, in defiance of the Missouri Compromise, the principle of 'squatter sovereignty' was applied to the two great territories lying north of 36° 30′ and as far as 49°—Kansas and Nebraska. The spirit of the North at last was aroused, anti-slavery men poured into Kansas (q.v.), waged war against the

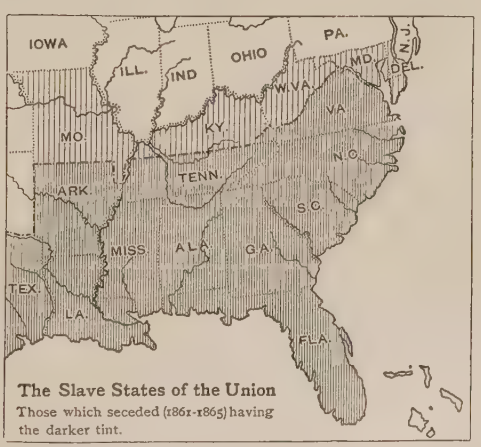
slave party there, and organised the state on a non-slave basis—though it was not admitted as a state until 1861. This struggle led to the formation of a new party in the North opposed to slavery, with democracy at the bottom and nationalist in spirit. This party adopted as its name that of Jefferson's old party, Republican, and grew with marvellous rapidity. In 1856 a presidential election was held; the Democratic candidate Buchanan was elected by a majority of the electoral vote, but Frémont, the Republican candidate, had a large popular vote. In 1856–57, in his opinion on the Dred Scott Case (q.v.), Chief-justice Taney stated, among other things, that a slave, or the descendant of a slave, could never be a citizen of the United States, and that the Missouri Compromise was unconstitutional. In 1860 the Democratic party was split into two sections, the southern or ultra-slavery Democrats and the northern or conservative Democrats. The southerners demanded the recognition by the party of the duty of congress to protect slavery; the northern Democrats could not possibly agree to this. In the face of a divided party, the Republicans elected their candidate, Abraham Lincoln, president. The North was now much stronger in population and wealth, and growing stronger every day. If the South remained in the Union it would soon be at the mercy of the North. The extreme southern states determined to secede; hoping, no doubt, that the North-west and California would either join them or remain neutral. But the newer states had been largely settled by foreigners, to whom the United States had been a star of hope for many years, until frugality enabled them to emigrate thither. They had no state pride, but were intensely loyal to the country which had received them and given them a chance in life.

United States in 1776
Ceded by England in 1783
Louisiana Purchase 1803
Purchased from Spain 1819
Received into the Union 1845
N. Western Boundary fixed 1846
Ceded by Mexico 1846
Purchased from Mexico 1853
The United States, showing the extension of area at various dates.

The North-west, California, and after a struggle Missouri, Kentucky, and Maryland cast in their lot with the North and East: about eight or nine millions in the South stood against twenty or twenty-two millions in the North, with the resources of wealth and increased production on the side of the latter. Indeed a wide gulf had come to exist between the highly industrialised economic system of the North and the plantation system of the South. The people of the South, however, were bred to command and to the handling of arms. From the first the government of the southern confederacy was despotic in practice. Such resources as it possessed were, therefore, at once used with effectiveness; while the North, unused to arms, and accustomed to do everything by committees or boards, and comparatively ignorant of war, was unable to make good use of its resources for at least two years. The war opened by the bombardment of Fort Sumter (q.v.) by the Confederates on April 12, 1861. At first everything went against the North, and for a while it seemed as if it would be obliged to fight England and the South at the same time. This was due to the seizure and removal from a British vessel of two southern political agents on their way to Europe (see TRENT AFFAIR).

In the beginning the sympathies of France, and still more of England, were on the side of the South. This was due in some measure to political and sentimental reasons, but in the case of England, at least, it was due partly to the cotton famine which followed the closing of the southern ports by the northern naval forces. In January 1863 President Lincoln, by proclamation, declared the slaves in the part of the South then in rebellion free. The character of the struggle was at once changed in the eyes of foreigners, and the sympathy of the outside world turned gradually to the North. Nevertheless the southern agents in England were able to fit out a vessel, the *Alabama* (q.v.), to destroy the northern shipping interests.

In April 1862 Admiral Farragut captured New Orleans on the Lower Mississippi, but the Confederates held the middle course of the river till the summer of 1863, when (July 4) General Grant captured Vicksburg. In this way the Confederacy was cut into two parts, and the control of the great stream was in the hands of the North from source to mouth. After defeating the Army of the Potomac at Chancellorsville, May 3, 1863, the Confederates attempted for a second time an invasion of the North. The Union army, now commanded by George G. Meade, met them at Gettysburg in south-western Pennsylvania, and on July 1, 2, and 3, 1863, after a most stubborn and bloody conflict, forced them back. Gettysburg and Vicksburg were the turning-points of the war. Soon after Grant was placed in command of all the armies of the United States, and for the remainder of the war operations were conducted on a syste-



The Slave States of the Union
Those which seceded (1861-1865) having the darker tint.

matic plan. General Meade retained command of the Army of the Potomac, to Sherman being confided the operations in Tennessee and Alabama. On September 2, 1864, Sherman entered Atlanta, Georgia. Sending a portion of his army back under General Thomas, he marched from Atlanta to Savannah on the Atlantic seaboard, and then turning north carried his army to Goldsboro. Thomas performed his work admirably, destroying the last army of the Confederates in the west at the battle of Nashville in December 1864. Meantime Grant with the Army of the Potomac, under the direct command of Meade, advanced towards Richmond, fighting the terrible battles of the Wilderness, Spottsylvania, and North Anna, and besieged the Confederate army in the lines of Petersburg. The siege lasted through the winter of 1864–65. Grant continued to extend his lines towards the south and west, thus cutting the Confederates off from their source of supplies. On the 2d of April the Confederates broke out through Petersburg, and attempted to escape towards the south and west. By almost superhuman endeavours Sheridan placed his cavalry and an infantry corps across their track, and on April 9, 1865, the Confederate army of North Virginia surrendered at Appomattox Court-house, and about two weeks later the last Confederate army which had been confronting Sherman surrendered. The war had cost the nation some $10,000,000,000 and the lives of some 600,000 men, besides perhaps as many more wounded. And while it had settled the question whether the United States was a nation or merely an aggregate of nations, and had rescued the South from the incubus of slavery, it left in its wake much economic and social distress, and many hard problems of political reconstruction. Before the end of the war, Tennessee, Virginia, Louisiana, and Arkansas had organised governments under a scheme of President Lincoln's. But the president was assassinated in April 1865. Reconstruction and reconciliation devolved as a task upon his successor, Andrew Johnson (q.v.). In the end the seceded states were again taken into the Union, on conditions contained in the 13th, 14th, and 15th amendments to the constitution, abolishing slavery, and giving the negro the right to vote. It cannot be said, however, that these conditions have accomplished their object, as even yet, in the southern states, the negro vote is in one way or another neutralised, while at the same time the South retains a representation in the House of Representatives based on its total population.

The nation found it difficult to settle down to peace. The pension system, which received a great stimulus during the war, developed into a national scourge, and at present the Civil War pensioners cost the nation an annual sum of over 170 million dollars. A sinister legacy of the war was the tendency towards fraud and corruption in political circles, and the formation of 'rings' throughout the states and cities (see TAMMANY SOCIETY), as well as in the national government. The Grant administration was especially notorious, and its popularity suffered in the industrial crisis of 1873. 'Big business' interests and politics were closely associated. Nevertheless from Lincoln onwards till 1884 the presidents (see list at PRESIDENT) were all Republicans—Johnson, Grant, Hayes, Garfield, and Arthur. Under Arthur much-needed steps towards civil service reform were taken, and the 'spoils system' to some extent undermined. In 1884 the reconstituted Democratic party elected Cleveland over Harrison. In 1888 the Democrats made the campaign on a basis of a reformed tariff, in the direction of less protection. The Republicans won, Harrison becoming president; and by the McKinley Bill and other measures reformed the tariff in the direction of greater protection. Trusts and combinations of capitalists everywhere resulted; while the relations of labour to capital became strained. Laws were passed excluding Chinese labour and rendering difficult the landing of paupers and of aliens under contract. In 1891 a House overwhelmingly Democratic was elected. In 1892 the contest again turned on tariff, and the elections resulted in the return of the Democratic candidate, Cleveland, by a very large majority over Harrison. The Sherman Silver Act (superseding the Bland Act) was repealed in 1893. A commercial crisis was marked by the rise of the 'Populists' (see GRANGERS), and a great march on Washington of the unemployed, as also by labour riots in Chicago. President Cleveland, in support of his Secretary of State, Richard Olney, intervened in the dispute between Britain and Venezuela (December 1895), and implied an extension of the 'Monroe Doctrine.' Britain at first resented American intrusion, but finally consented to submit the difference to arbitration (1899). In 1896 the presidential contest, largely on the silver question, resulted in the election of McKinley (q.v.) over the silverite and Democrat Bryan (q.v.).

In 1867 the United States had purchased Alaska from Russia, the principal result of which was recurring trouble with Great Britain as to the right to capture Seals (q.v.). But the closing years of the nineteenth century witnessed the appearance of a new element in United States policy, namely, the beginnings of imperialism. Previously the acceptance of the Monroe Doctrine (see MONROE), excluding European occupation of any new areas on the American continent, had been held as implying the converse doctrine that the United States did not propose to occupy territory outside the North American continent. Thus under the constitution there were obvious difficulties in the way of holding lands whose inhabitants were not to be admitted to political privileges as citizens of the republic. But when domestic troubles allowed time for other matters, the United States cast its eyes upon the Pacific and the Caribbean. Hawaii was definitely annexed in 1898, and finally admitted as a territory in 1899. And in 1899 Samoa, since 1889 recognised as neutral and independent under the joint protection of Great Britain, Germany, and the United States, was divided between the two latter, Great Britain withdrawing. The result of the war with Spain in the same year left Cuba (q.v.) an American dependency, its status being that of a military protectorate until 1902, when, under certain conditions, it was made an independent republic. The war with Spain led also to the United States (on payment of $20,000,000 to Spain) assuming authority over the Philippine Islands (q.v.), in spite of the strenuous opposition of the native armies under Aguinaldo, who in 1901 still aimed at complete independence. Porto Rico (q.v.) was made over by Spain in 1898; Guam, the largest of the Ladrones (q.v.), was ceded at the same time, the rest of the Ladrones, Pelews, and Carolines being sold by Spain to Germany. The United States also took part with the European powers in armed intervention at Peking in 1899-1900; and an arbitration treaty with Britain and other countries was arranged for.

McKinley was elected for another term in 1900, but in September 1901 he was shot by an anarchist. Theodore Roosevelt, the vice-president, took his place, and though he announced that there would be no change of national policy, he took a much greater interest than McKinley in such questions as administrative and social and industrial reform, regulation of trusts and railways, and plans for the conservation of the natural resources of the

United States. During Roosevelt's first term the status of Cuba (q.v.) was settled; progress was made in the Philippines; the navy was very greatly strengthened; the Isthmian Canal question was solved in favour of the Panamá route, and the republic of Panamá recognised. A treaty (1903) with Panamá gave the United States a perpetual lease of a canal zone, ten miles in width, and work was begun (see CANALS). The Monroe Doctrine was reasserted with emphasis and with new interpretations in the dealings with Venezuela and Santo Domingo. In a second term (1905–9) Roosevelt maintained his popularity by the same policy. Reform and trust regulation, however, had been steadily threatening to divide the Republicans into progressive and conservative groups. Only Roosevelt's personality kept the party together, and when he was succeeded in 1908 by Taft, the Republicans were doomed. The congressional elections of 1910 went against them, and in the presidential election of 1912, Woodrow Wilson, the Democratic candidate, defeated the two Republicans, Roosevelt and Taft. Wilson gained favour by his anti-trust activities and his measures of tariff and financial reform, but the outstanding problems of his presidential career were concerned with foreign relations. Disturbances in Mexico involved the attentions of the United States from 1913 to 1917. A policy of 'watchful waiting' was abandoned when Wilson sanctioned the occupation of Vera Cruz in 1914 and again when he dispatched a considerable army on a punitive expedition into Mexico. Open war seemed imminent on several occasions but was avoided, though American troops were only withdrawn from Mexican territory in 1917. Meanwhile, under the shade of the Monroe Doctrine, the United States tightened its grip upon the Caribbean, giving it undisputed naval supremacy in that area. In 1916 Nicaragua and Haiti came under its financial administration, and the Danish West Indies were purchased for 25 million dollars.

But the chief foreign problem at this time was presented by the World War (q.v.). On August 4, 1914, President Wilson issued a proclamation of neutrality. The United States, however, in its position as the chief source of supplies for the belligerents, was bound to be involved when both sides adopted a policy of hostility towards neutral shipping. The president lodged several sharp protests against the highly restrictive blockade system adopted by the British navy, but he had to protest even more strongly against the indiscriminate warfare carried on by German submarines. The sinking of the *Lusitania* in 1915, and several similar incidents involving the loss of American lives turned opinion against Germany. The policy of neutrality gave way to one of 'preparedness,' and the strength of the army and navy was increased. However, Wilson had not openly committed himself, and his foreign policy, both European and Mexican, was severely criticised in the presidential election of 1916. He had recently wrung a promise from the German government that the ruthless submarine warfare would be mitigated. His supporters were able to say 'he kept us out of war,' but enthusiasts for war were exasperated. He defeated his opponent, Hughes, but the majority was small. In February 1917 Germany threatened an unrestricted submarine campaign, and diplomatic relations were broken off. Also secret dealings with nefarious intent between Mexico and Germany had been brought to light. On April 2 the president in a memorable address to congress advised it to 'declare the recent course of the Imperial German Government to be in fact nothing less than war against the government and people of the United States.' Four days later war was declared, congress having passed the measure by no uncertain vote. An expeditionary force under General Pershing, who had commanded in Mexico, was dispatched to France, but the actual military accomplishments of the United States were comparatively small, as the transportation of troops in large numbers to Europe was a difficult task. But its potential capabilities doubtless turned the scale in favour of the Allies, while its financial help was welcomed in the time of crisis. President Wilson figured largely in the peace dealings. An offer of his to act as mediator at the end of 1916 had failed, but in January 1918 he outlined his peace programme, the famous 'fourteen points' which were supplemented by numerous others at later dates. With four commissioners he repaired to Paris to the Peace Conference and played an important part in the drawing-up of the Treaty of Versailles, especially in its relationship to a League of Nations (q.v.) of whose principle he was the champion. He signed the treaty for the United States, but it was not ratified by the senate, and technically the United States remained at war with Germany. The congressional elections of 1918 had turned against the Democrats, and in 1919 Wilson fell almost entirely from public favour, and the end of his presidential career was impeded by illness. (See WILSON, WOODROW). His successor was a Republican, Harding of Ohio, who won a very substantial victory over his Democratic opponent, Cox. The task of economic reconstruction which the war had left demanded the executive strength of a Roosevelt or a Wilson; politics, moreover, were becoming less stereotyped and more unmanageable by reason of the weakening of the two-party system and the activities of a radical group under La Follette. Harding, in the face of these difficulties, was only moderately successful in his policy of making a 'return to normalcy.' Industrial and agricultural depression and disputes were rife; the Shipping Board, established in 1916, had overreached itself in its construction schemes and lost heavily; the pensions system threatened to run riot; and immigration was a pressing problem. In foreign politics Harding's career was marked by the official conclusion of the war by treaties with Germany, Austria, and Hungary; by the calling of a conference at Washington (q.v.) to discuss amongst other things the limitation of naval armaments and problems of the Pacific; and by the conclusion of a war debt settlement agreement with Great Britain and some of the smaller belligerents. Harding died in August 1923, and was succeeded by his vice-president, Calvin Coolidge, who carried the presidential election of 1924 by a sweeping majority in spite of Democratic attempts to discredit the previous Republican régime. Numerous other debt-funding arrangements were concluded. Coolidge also took up the task assumed by Harding, namely, that of arbitrating between Chile and Peru in the Tacna-Arica dispute. The United States has remained outside the League of Nations, though it has interested itself in some of the League's commissions; nor has it yet seen its way clear to adhere to the Permanent Court of International Justice.

The notices in this work of the various presidents and many of the leading statesman, soldiers, and sailors, as well as those on the several states and the leading cities, the articles on Agriculture, Congress, Cotton, Emigration, Immigration, National Debt, Negroes, Railways, Slavery, Universities, and hundreds of others help to complete the preceding historical sketch.—For further study it is impossible to give anything more than the names of a few general works; innumerable treatises deal in detail with almost every event and aspect of United States history. The most outstanding large works on the history of the United States and its people are those by E. Channing (6 vols. 1905–25), J. B. McMaster

(7 vols. 1883–1910), J. F. Rhodes (8 vols. 1892–1919), J. Schouler (6 vols. 1899), Von Holst (8 vols. 1899), W. Wilson (5 vols. 1902); also the 'American Nation' series, edited by A. B. Hart (28 vols. 1904–8). Other writers whose contributions to the study of the history and constitution of the United States are notable are: E. M. Avery, C. A. and M. R. Beard, C. R. Fish, H. C. Lodge, C. E. Martin, H. L. Osgood, F. L. Paxson, Sir G. O. Trevelyan, C. H. Van Tyne, J. A. Woodburn. The list might be extended almost indefinitely, but many of the above books contain bibliographies to which reference may be made for more detailed works. See also Vol. VII. of the *Cambridge Modern History*.

AMERICAN LITERATURE.

In the absence of populous centres and of leisure for the æsthetic arts, the American colonist was as dependent upon the mother-country in letters as in politics. And although from the Stuart restoration there were indications of a divergence in social and political temper, which in the long-run had to find expression in a distinct American literature, yet the literary emancipation of America was much slower than the political.

I. Before the middle of the 18th century there was in the colonies no literature worthy of the name. New England had some vigour of intellectual movement, which was controlled by men who had enjoyed the academic advantages of the English universities, or of the substitutes for these they had established in America in Harvard (1638) and Yale (1700) colleges. Samuel Sewall, John Wise, and Cotton Mather (1663–1728) are worth mentioning, but the literary output was practically confined to historical or theological work. It is rare that moral and spiritual earnestness have the wisdom to enlist beauty of form in their service, and this is especially evident in verse. The *Bay State Psalm-book* (1640) takes rank among the worst and most tasteless books of a class which abounds in such, while the poetry of Mrs Anne Bradstreet (1612–72) had great vogue in its day.

The influence of the new English prose of Steele and Addison made itself felt slowly. It did very little for the style of Jonathan Edwards (1703–58), who was notable as a naturalist, metaphysician, and divine. Much better in point of literary form, although with just as little purpose of achieving it, is the Quaker John Woolman (1720–73), whose *Journal* (1774) delighted Lamb and Edward Irving. A better representative of the prevalent temper of the colonies, and more ambitious of literary distinction, is Benjamin Franklin (1706–90). In him the thrift and shrewdness of that later day displaces the Puritan enthusiasm; and we learn from his *Autobiography* (1817) that he formed his style on the accepted models of the new English prose.

II. From the rise of Franklin into influence until the close of the second war with Great Britain, Philadelphia was the intellectual and literary centre of the country, as it was the largest and most thriving centre of population. The pseudo-classic school dominated American taste, and Pope was reckoned the greatest of poets. The ambition of patriotic American writers was to rival the authors of the mother-country in the forms then accepted by both; and America lingered far behind in the movement for the introduction of more delicate and melodious cadences of verse.

The struggle for independence was the occasion of some strong and able writing on political topics, but of nothing whose literary quality entitles it to a place beside the speeches of Chatham and the pamphlets of Burke. The style of Thomas Paine (1737–1809) has vitality, and has done much to keep his writings on politics and religion from oblivion, in spite of their shallowness and frequent coarseness. Philip Freneau (1752–1832) is almost the only patriotic lyrist worthy of mention; but his fluency and his occasional felicities have not secured him any continuous popularity. Francis Hopkinson (1737–91) produced some clever satirical skits; and his son, Judge Joseph Hopkinson (1770–1842), wrote in 1798 the first national song, 'Hail Columbia!' John Trumbull (1750–1831) applied the metre and manner of *Hudibras* to the chastisement of the Tories in his *M'Fingall* (1782), and won great popularity; and Dr Timothy Dwight of Yale College wrote epics. The struggle over the adoption of the national Constitution in 1787–89 brought into play more ability in political writing than did the war, the most shining name being that of Thomas Jefferson (1743–1826). The first political classic of America, *The Federalist* (1788), is a series of papers in which Hamilton, Madison, and Jay advocated and explained the new scheme of government. To Hamilton also is ascribed President Washington's 'Farewell Address' (1796), another political classic.

Philadelphia for a time was the seat of the new government. She had the most enterprising publishers, the best periodicals, the widest circle of readers; and her people loved to speak of her as the 'Athens of America.' Authors from other parts of the country made her their home, or sent their books to her publishers, and their contributions to her magazines. The first professional man of letters, Charles Brockden Brown (1771–1810), wrote a series of novels which were republished in England, and are known to have exerted a great influence over Shelley. They belong to the dominant school of 'Monk' Lewis and Mrs Radcliffe, but are sufficiently individualised by their clear, nervous style, and by their power of imaginative portraiture to claim recognition. William Dunlap (1766–1839) was the first writer of any prominence for the stage. In 1828 Noah Webster (1758–1843) published the first edition of his Dictionary.

III. About the year 1816 pre-eminence in literature began to pass from Philadelphia to New York, just about the time when the completion of the Erie Canal put that city in the way of benefiting by the growth of the west. But the cause of the transfer is found in the superior susceptibility of a group of New York authors to the new literary influences represented by Wordsworth, Byron, and Scott, which the critics of the rival city treated with contempt.

Washington Irving (1783–1859) had already written *Knickerbocker's New York* (1809), the most American of his books, and the first classic piece of American humour. His residence in England brought him into contact with the Romantic movement in literature. In *The Sketch Book* (1819), *Bracebridge Hall* (1822), and *Tales of a Traveller* (1824) he showed the new influence; and he transplanted this Romantic tendency to the New World in his tales of colonial life on the Hudson. A subsequent residence in Spain awoke his interest in the popular traditions of that country, and its history during its period of American discovery. Later he turned to biography. His works still delight those who appreciate the quiet beauty of their style, the lambent Addisonian humour, and their genial spirit; but they lack robustness and sympathy with the age.

No want of the American quality can be charged upon James Fenimore Cooper (1789–1851), although he also received the literary impulse from Scott. His novels, *The Spy* (1821), *The Pioneer* (1823), and *The Last of the Mohicans* (1826), laid the foundation of a new literature by showing the imaginative interest which attaches to the pioneer life and to the Indian character; and his naval tales, beginning with *The Pilot* (1823), made an impression equally vivid. He wrote too much, however, to write well,

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and to avoid repeating himself; and he unduly idealised both the sailor and the red man. Among his contemporary imitators are James Kirke Paulding (1779–1860), John Pendleton Kennedy of Baltimore (1795–1870), and William Gilmore Simms (1806–70), a South Carolina planter.

William Cullen Bryant (1794–1878), before he made New York his home in 1825, had already done much of his best work as a poet, and had illustrated his passage from the school of Pope to that of Wordsworth. He has the English poet's contemplative sympathy with the greatness and the calm of nature; but his first-hand intimacy with her subtlest moods, his almost uniform loftiness of imagination, and his severe self-restraint forbid us to class the author of 'Thanatopsis' and 'To a Water-fowl' as any man's disciple merely. He lacked only warmth of passion and continuous growth to become the greatest of American poets. Less of a voice and more of an echo is Fitz-Greene Halleck (1790–1867), while Joseph Rodman Drake (1795–1820) justified Halleck's fine dirge over his untimely death. Minor poetry flourished considerably, and it will suffice to mention Mrs Lydia Sigourney (1791–1865), a facile and prolific writer, and Francis Scott Key and John Howard Payne, the authors of 'The Star-spangled Banner' (1814) and 'Home, Sweet Home' (1823) respectively. Nathaniel Parker Willis (1806–67), traveller and journalist, wrote both verse and prose.

IV. A new period begins about 1838 with the transfer of literary pre-eminence to New England, and especially to Boston, and lasts until the war for the Union. America now came into contact with literatures other than that of England, and the broader culture thus attained was accompanied with a more vigorous independence. A literary class arose, so that letters no longer were the ornament of a learned profession or secondary work of an editor. The first impulse to better things came from the study of Coleridge, which led on to that of the poets, critics, and philosophers of Germany, and thus put an end to the dominance of the sensualistic 'common-sense' philosophy of Locke.

Ralph Waldo Emerson (1803–82) is almost more important as a personal influence and inspiration than as a man of letters. His doctrine of the sovereignty of the individual conscience met the needs of a time of general revolt against the social and intellectual traditions. He denied the validity of any lines the conscience did not draw for itself; and, although he combined with this the recognition of an Over-soul, this phase of his teaching made less impression, as the Over-soul is an impersonal something, which is at once identical with and different from the individual. After the appearance of *Nature* (1836) and his *Essays* (1841–44) his home at Concord was the centre to which pilgrims came to find his secret of lofty serenity in full view of the puzzles of the universe. His prose is more important than his verse, which is uneven and often faulty in structure, but with many fine lines and felicitous phrases. His prose has been called a 'difficult staccato'; the sentences do not fuse into paragraphs, but read as if there were at the end of each a pause for a reply. Under his audacities lies the shrewdness of New England, and the homely mother-wit of his own people.

The group around Emerson, called the Transcendentalists, were of various magnitudes and qualities. The author of *Walden*, Henry David Thoreau (1817–62), whose reputation has steadily grown, found in intimacy with nature an escape from the pettinesses of men; Amos Bronson Alcott (1797–1888) undertook the reform of education on the principle that all important truth was to be found in the intuitions of children; Margaret Fuller-Ossoli (1810–50), the 'Zenobia' of Hawthorne, made most impression by her conversational faculty; Jones Very (1813–80) wrote poetry 'by inspiration' during the years 1836–39. His poems, which Emerson edited, are narrow in range, but have a delicate wild-flower beauty of their own. These and others contributed to *The Dial* (1840–43), and most of the group took part in the famous Brook Farm (q.v.) experiment in communism, organised by George Ripley (see also TRANSCENDENTALISM).

On the outskirts of the group, as an interested and curious spectator, stood Nathaniel Hawthorne (1804–64), a religious and social conservative, with a passion for the study of the abnormal, which we may trace to his early environment at Salem, where one of his ancestors had been judge in witchcraft time. His works give us life as seen in 'the moonlight of romance,' and stand in curious contrast to his own life as office-holder and man of affairs in a world he really held at arm's length while attending to its routine. His *Twice-told Tales* (1837–42) already surpassed all previous American writing in the field of prose fiction; and *The Scarlet Letter* (1850) secured his position as the greatest of American prose-writers. His art is thoroughly idealist—character, incident, and situation being subordinate to the haunting idea of the story he is telling. His style is one of exquisite purity, delicate humour, and a genuine pathos.

Of the poets of this period Henry Wadsworth Longfellow (1807–82) filled the largest space in contemporary attention, and thus rendered the greatest service to his countrymen in awakening the love of beauty, and extending the taste for pure art to a wider circle than was reached by any other American. He is the first and chief representative in American verse of that great Romantic movement which Irving in a different way reflects in his prose. As such he was drawn to the past and the distant for his favourite themes, and echoes but faintly the life of the present. *The Golden Legend* (1851), a study of mediæval life, is his most perfect poem, and *Hiawatha* (1855) his most popular. His *Poets and Poetry of Europe* (1845) and his translation of Dante's *Divine Comedy* (1867) amplified the resources of American thought and taste, while exhibiting his own cosmopolitanism. Even in handling American subjects he turned to Europe for metrical forms and for illustrations. Though his verse has an undefinable charm and grace, it lacks depth and passion.

A greater poetic force and a wider range of movement is seen in James Russell Lowell (1819–91). A scholar of wide learning, and a luminous critic of other men's work, he was free from the bookish tone of Longfellow. He wrote of man and of nature at first-hand. His poetry reflects the deepest life of his time, especially of the great struggle with slavery; and it covers the widest range of tone, from the pure æstheticism of his first work to the intensity of 'The Present Crisis' (1845) and the 'Harvard Ode' (1865), and again to the racy fun of *The Biglow Papers* (1848 and 1867). These last mark the highest point reached by American humour, and they also open the series of dialect-writing.

With more monotony, but inferior to none in poetic passion and affluence of imagination, John Greenleaf Whittier (1807–92) takes his place as a lyric and idyllic poet. Burns's poems early gave direction to his genius, and helped him to become the poet-laureate of abolitionism, so that much of his verse is its battle-cry. But like Burns he was at his best in the idyll, and his *Snow-bound* (1866), although pitched in a key somewhat too high, is full of true and tender beauty.

Oliver Wendell Holmes (1809–94), the last

survivor of the group, made his reputation as the wittiest and one of the most polished of American poets, and then, in his forty-eighth year, entered upon a new field of prose-writing in his *Autocrat of the Breakfast-table* (1858), with a success which all but eclipsed his poetry. In both he displays those lasting excellences of 18th-century writing which have won admirers and imitators among younger American writers and critics. His verse is characterised by epigram and sparkle, but seldom rises to passion.

Notable poets were not confined to New England. Edgar Allan Poe (1809–49), a strangely isolated but fascinating figure, represented in his verse, and maintained in his critical writing, the principle, then a novelty, of 'Art for Art's sake,' against the didacticism of his contemporaries. From Coleridge and Shelley he had learned the possibilities of melodious cadence, and put the lesson to use in verse that is perfect in its rhythmic flow. His weird tales, in which a powerful imagination and a fine artistic sense deal with motives of horror and melancholy, have exerted a wide influence in European and especially French literature.

Yet Walt Whitman (1819–92) has attracted nearly as much attention in Europe for the opposite reasons. In his *Leaves of Grass* (1855 *et seq.*) he carried Emerson's sovereignty of the individual into art and morals, casting aside the restraints of rhyme and rhythm as 'feudal,' and valuing life in all its manifestations, humble and sublime, physical and spiritual. The reputation of this lover of freedom and democracy has steadily grown from small beginnings, till he has become an enormous power in modern thought. His verbal audacities are not, however, always very happily chosen.

The minor poets of the period include Henry Timrod and Paul Hamilton Hayne, both from the south; George Henry Boker from Philadelphia; Dr Thomas Williams Parsons, Rev. Charles Timothy Brooks, the two last being also known as translators; Bayard Taylor (1825–78), traveller and novelist, best known by his admirable rendering of Goethe's *Faust;* Richard Henry Dana (1787–1879), who combined versatility with romanticism; and Julia Ward Howe (1819–1910), an ornate and impassioned lyrist. In the matter of prose writing, the polemic purpose does not detract from the general interest of *Uncle Tom's Cabin* (1852) by Harriet Beecher Stowe (1812–96), but as works of art, her stories of New England, *The Minister's Wooing* and *Oldtown Folks*, are superior. Herman Melville (1819–91) with *Moby Dick* and other stirring sea-novels has come into his own again after a period of neglect. George William Curtis (1824–92) shows satiric power and beauty of fancy in his novels, books of travel, and essays. The *Two Years before the Mast* (1840) of Richard Henry Dana, jun., is an excellent book of adventure. Mrs Lydia Child sacrificed her literary talents to a career of public service. Charles Godfrey Leland and Henry Theodore Tuckerman were *littérateurs* of some merit, and the novels of Susan Warner were popular in their day.

Theology in the hands of its best writers resumed something of its earlier relations to literature. William Ellery Channing (1780–1842) carried the gentle spirit of a Protestant Fénelon into the polemic time of the severance of Unitarian from Orthodox. Theodore Parker (1810–60) applied hard-headed logic and resonant rhetoric to the compromises of both church and state, sharing with Channing in the honours of the anti-slavery struggle. Horace Bushnell (1802–76) laboured to bring the Puritan divinity into harmony with the humaner thought of his age; a mission undertaken in a different way and with less depth of insight by Henry Ward Beecher (1813–87) as a popular preacher and essayist.

Political eloquence early sought to win by beauty of form. That of Henry Clay (1777–1852), Daniel Webster (1782–1852), and John C. Calhoun (1782–1850) belongs to an era before that which we are considering. But the succession of political orators was ably sustained by Edward Everett (1794–1865), Charles Sumner (1811–74), and Wendell Phillips (1811–84). It used to be said that 'eloquence was dog-cheap with the Abolitionists,' and it also might be said of poetry. But the movement has not left much prose of lasting merit. Channing, Emerson, Parker, Beecher, Phillips, and Mrs Child were its best-known writers.

Thanks to the influence first of Coleridge and then of the Germans, literary criticism entered upon a new phase, learning to contemplate every work of art as an organic whole and in the light of its leading idea. Poe and Margaret Fuller did excellent work in exposing the weakness of mere literary pretenders, and even the faults of the strong. Henry Reed (1808–54) and Henry Norman Hudson (1814–86) worthily opened the series of American Shakespearian specialists. Francis James Child (1825–96) edited the Boston collection of the British poets, and, in the *English and Scottish Ballads* (1857–59) with which it opens, laid the foundation of his fame as the chief master of that subject. George Ripley and Frederick Henry Hedge turned their attention more to European (especially German) philosophy and literature. In philology George Perkins Marsh and William Dwight Whitney (1827–94) achieved distinction.

In history the achievements of the period have great merit. The spirit of research in both American and related fields was stimulated by contact with German scholarship. With George Bancroft (1800–91) American history put on a thoroughness and a dignity worthy of the subject; but his *History of the United States of America* is florid in style, and not always free from prejudice. Richard Hildreth and John Gorham Palfrey wrote historical works of merit. William Hickling Prescott (1796–1859), following the example of Irving, devoted himself to the Spanish side of American history, and that of Spain in the period when her relations with the American continent were most intimate, beginning with *Ferdinand and Isabella* (1837). He has a clear, graphic style, and is master of the art of lively and picturesque narrative; but, in spite of his scrupulousness in research, later scholarship has called in question many of his conclusions. His friend and biographer, George Ticknor (1791–1871), was past the prime of a life of scholarly research when he published his *History of Spanish Literature* (1849), still regarded as a classic. John Lothrop Motley (1814–77) took as his theme the heroic age of the Dutch nation, throwing himself into the struggle with Spain so fervently as at times to obscure his judgment; but the vigour this imparts to his histories makes up somewhat for lack of simplicity. Francis Parkman (1823–93) belongs properly to this period, though many of his works were actually written after it. His books on French-American history are characterised by vividness of description, grasp of the leading issues at stake, and soundness of judgment.

V. The year 1860 is a dividing line in the history of American literature, as of politics. The great social convulsion it ushered in had a powerful effect on the intellectual development of the country; and the intense sense of nationality then awakened has been reflected more adequately in literature than in any other form of art. On the other hand, the war showed the Americans the variety as well as the magnitude of their country, and the aristo-

cratic thought of the East had to make room for the democratic expression of the West. Although many of the great writers of the Boston circle lived on and wrote, they opened no new vein; and the younger attained no marked superiority over their rivals elsewhere. New York, by virtue of its advantages as a distributing centre, attracted men of letters to residence, but did not create any distinct public interested in their presence.

The new scientific spirit, which dates from the appearance of Charles Darwin's *Origin of Species* (1859), affected literature in many ways, but especially in teaching to view life as a whole and in its complexity, and in showing that every object of study represents a stage in a development and must be understood in the light of its past. Along with this there has been an increased love of prose fiction—the form of imaginative art that most easily complies with these scientific demands.

In poetry there is no name of the latter part of the 19th century that can be put beside the group which begins with Bryant and ends with Holmes, for the tension of the war was followed by a reaction. Further, though the new poetry perhaps studied nature more closely and exhibited superior technical finish, it generally contemplated the problems of existence in a less hopeful spirit. Sidney Lanier (1842–81) aimed at musical effects in verse which he did not always attain. Edmund Rowland Sill inspired regret that his rare genius closed its career just as its best became possible. The work of Thomas Bailey Aldrich (1836–1907) and Richard Watson Gilder is rich but refined; that of Emily Dickinson (1830–86), which was published posthumously, mystical and delicate. John Hay revealed a command of peculiarly American humour and pathos, and James Whitcomb Riley touched the popular heart by the humanity of his varied verse. Joaquin Miller (1841–1913) wrote picturesque and vigorous prose and verse; while Richard Henry Stoddard (1825–1903) and Edmund Clarence Stedman (1833–1908) were also known as critics.

In America, as elsewhere, prose fiction wrested from poetry the place of pre-eminence, and by its popularity enlisted the pens of many who were better fitted for other work. William Dean Howells (1837–1920), in a long series of works, portrayed American life with a fidelity to both its brighter and its duller sides which has led others as well as himself to class him with the Realists; but he never gives us photography in the place of art. In brief, half-dramatic sketches he is incomparable. Francis Marion Crawford (1854–1909) showed a much greater range, grasping with a firm hand the most varied forms of old-world life, making both situation and character vivid in interest, but avoiding American subjects. Henry James (1843–1916), like Howells, sometimes wrote of 'those who delight to dwell in Boston,' but hardly in an American spirit. Cosmopolitan in his outlook, his strength lay in acute and subtle psychological analysis; character, not plot, was his constant preoccupation. Edward Everett Hale did much to maintain loyalty to the Union by his tale *The Man without a Country* (1863). Louisa Alcott lifted the art of writing stories for the young to a higher level. Frank Stockton with *Rudder Grange* (1879) belongs more to the humorous school, and Lew Wallace with *Ben Hur* (1880) to the romantic; while Thomas Winthorp and Frances Hodgson Burnett are names worth mentioning.

One of the characteristics of the fiction of this period is the prominent use of local colour and sometimes dialect (coincident with the settling and colonising of the Middle and Western states), and of these regional novelists the most original was undoubtedly Francis Bret Harte (1839–1902), whose vivid *Luck of Roaring Camp* and other books dealt sympathetically but realistically with the rough life of the Californian miners. George Washington Cable (1844–1925) and Mary Noailles Murfree ('Charles Egbert Craddock,' b. 1850) discovered to literature the picturesque life of the Louisiana creole and the east Tennessee mountaineer. Sarah Orne Jewett and Mary Eleanor Wilkins (b. 1862) interpreted New England life and character with fidelity and charm. The south offers Joel Chandler Harris ('Uncle Remus,' 1848–1908), Thomas Nelson Page, and James Lane Allen; the middle west, Edward Eggleston, Mary Hallock Foote, and Hamlin Garland (b. 1860); New York state, Harold Frederic. Humour is an element almost universal in American fiction, but this period produced special representatives in Henry Wheeler Shaw ('Josh Billings'), Finley Peter Dunne ('Mr Dooley'); but above all in Charles Farrar Browne ('Artemus Ward,' 1833–67) and Samuel Langhorne Clemens ('Mark Twain,' 1835–1910), who achieved international reputations by combining the whimsical and the grotesque with the realistic and the pathetic.

History and biography profited through the popularity of the evolution theory, the growing interest in sociological problems, the patriotic impulses stirred by the war, and the diffusion of the literary culture which fits to undertake a work of this class. In many cases contact with German methods was helpful. Of the picturesque school, Motley and Parkman continued to write after 1860. Writing on the period of the independence of the republic, Henry Adams fixed attention most upon government and politics, and John Bach Macmaster upon social life and usages. The histories of the United States or of periods of American history, by Justin Winsor and John Fiske (1842–1901), became standard works in virtue of their completeness, clearness, and thoroughness. The war for the Union produced a deluge of writing of very various degrees of merit, culminating in the monumental work (1893–1919) of James Ford Rhodes. Woodrow Wilson produced many admirable studies, including *History of the American People* (1902). Local history, especially that of New England and of the separate commonwealths of the Union, came soon to be a branch of literature. The Life of Napoleon by William Milligan Sloane, the books on the Spanish Inquisition by Henry Charles Lea, the studies of naval science by Alfred Thayer Mahan are important contributions by Americans to foreign history.

In philosophy the era was notable for naturalisation of the most various schools of thought in America, that of Hegel having the most vogue with the specialists in philosophy, and that of Herbart with the educators. The *Cosmic Philosophy* of John Fiske showed the influence of Herbert Spencer; while William James (1842–1910), a brilliant writer and thinker, became famous as the exponent of Pragmatism. Phillips Brooks was a prominent theologian. In the field of belles lettres much interesting work was done. Charles Dudley Warner (1829–1900) wrote graceful essays and travel sketches. Thomas Wentworth Higginson (1823–1911) was a prolific and versatile writer; and John Burroughs (1837–1921) continued in a lighter vein the work of Thoreau. Horace Howard Furness and Thomas Raynesford Lounsbury secured high rank as critics of Shakespeare and Chaucer respectively; and Charles Eliot Norton specialised in æsthetics. Edwin Percy Whipple, Stoddard, and Stedman were well-known critics.

VI. The Spanish war of 1898, and the Great War (with the inevitable disillusionment following on the latter) on the one hand, and the rise of industrialism on the other, have driven the literature and thought of the 20th century down to

fundamentals (but realism has been tempered with satire), and a social consciousness has been created. The revival of poetry after the interregnum of the eighties and nineties, and the rise of the drama (for the first time in America) to a place of importance, are characteristic and significant.

The heralds of the new movement in poetry who unfurled the banner of revolt at the beginning of the century were Richard Hovey, William Vaughn Moody, Edwin Markham, and Bliss Carman. The artificiality of poetic diction is largely superseded by the simplicity and sincerity of everyday speech, but the movement did not attain its fullest expression till the second decade. Edwin Arlington Robinson (b. 1869), in *The Man Against the Sky* (1916) and other works, searches keenly after truth, but his intellectuality, expressed in high technical accomplishment, is touched with gentle emotion. Edgar Lee Masters (b. 1869), in *Spoon River Anthology* (1915), with devastating frankness revealed all the sordid pettiness and gentle heroism of town life in the Middle West. Robert Lee Frost (b. 1875), penetrating, fastidious, and restrained, but whimsical at times, became the mouthpiece of New England with that amazing 'book of people,' *North of Boston* (1914); while Carl August Sandburg (b. 1878), both realist and mystic, contrasts the crashing whirl of machinery with nocturnes of quiet beauty, with Chicago as the setting.

The Imagists, insisting on the exact word, clear particularisation, and freedom in choice of subject, form a group by themselves. The leadership passed from the restless genius of Ezra Loomis Pound (b. 1885) to the versatile Amy Lowell (1874–1925), whose work (which also includes narrative verse and 'polyphonic prose') sparkles and glitters with colouring and imagery. The abundant imagination and fantasy of John Gould Fletcher (b. 1886) and the exquisite polished art of Hilda Doolittle (Mrs Aldington; 'H. D.,' b. 1886) are the other notable American contributions to the Imagist poetry.

Nicholas Vachel Lindsay (b. 1879) draws his inspiration from the syncopated music and the naïf evangelism of the American negro, and preaches the 'Gospel of Beauty.' It must be sufficient to recall the exaltation of James Oppenheim, the irony of Thomas Stearns Eliot, the music of Conrad Aiken, the lyricism of Sara Teasdale and Edna St Vincent Millay, and to mention by name Charles Erskine Scott Wood, John Hall Wheelock, Alan Seeger, Louis Untermeyer, William Ellery Leonard, John Gneisenau Neihardt, and the brothers Stephen Vincent Benét, and William Rose Benét.

Two main contrasting strains were present in the novel at the beginning of the 20th century. The immensely popular historical romances, extravaganzas, and tales of adventure of Winston Churchill (b. 1871), Paul Leicester Ford, Silas Weir Mitchell, Richard Harding Davis, and Mary Johnston provided an escape from the commonplace and materialistic of the day; while the work of Mrs Craigie ('John Oliver Hobbs'), Elizabeth Stuart Phelps, and Gertrude Franklin Atherton was intellectual, individualistic, and dealt with contemporary social and religious problems. Robert William Chambers (b. 1865) and Newton Booth Tarkington (b. 1869) turned from romances to novels of society, Kate Douglas Wiggin wrote entertainingly about New England, and Jack London (1876–1916) won popularity with his vivid sensational stories of the wilds. Stephen Crane and Frank Norris (especially the latter) anticipated the powerful and life-like fiction that became so characteristic of the first quarter of the new century.

The novels of Edith Wharton (b. 1862), clever, cosmopolitan, provide a setting for brilliant *bons-mots;* while those of Upton Sinclair (b. 1878) are largely coloured by socialist propaganda, but make vigorous reading. The two great champions of modern realism are Theodore Dreiser (b. 1871) and Sinclair Lewis (b. 1885). Dreiser, in *The American Tragedy* (1925) and other monumental works, conceives life as a struggle between man and the elemental forces of nature, but always allows the individual the right of self-expression. Sinclair Lewis uses his brilliant gifts of satire to remove false sentimentality and to expose the hollows and shams of much of the life in the Middle West. Sherwood Anderson (b. 1876) proves himself a penetrating critic of the so-called modern civilisation. The *Jurgen* (1919) of James Branch Cabell (b. 1879) is set in a world of unusual fantasy, avoiding the commonplace and cultivating the exotic. Willa Cather (b. 1876) combines breadth of sympathy with subtlety of treatment, and the decorative element is strong in the work of Joseph Hergesheimer (b. 1880). Other important and interesting contemporary novelists are Robert Herrick, Elinor Wylie (also a poetess), Carl van Vechten, Zona Gale, Ernest Poole, Floyd Dell, Margaret Wilson, and Ellen Glasgow. The short story, though practised more or less by most of the novelists, came to be peculiarly associated with William Sydney Porter ('O. Henry,' 1862–1910). Harold Bell Wright, Zane Grey, and Gene Stratton Porter are successful writers of popular fiction.

The theatre is represented in this period by Clyde Fitch, Charles Klein, Percy MacKaye, but particularly by the powerful and sensational tragedies of Eugene Gladstone O'Neill (b. 1888). The principal essayists and critics are James Gibbons Huneker (1860–1921), George Edward Woodberry, James Brander Matthews, Christopher Morley, Henry Louis Mencken, William Peterfield Trent, Stuart Pratt Sherman, Henry Seidel Canby, Carl van Doren. Theodore Roosevelt, Walter Hines Page, and Booker Taliaferro Washington are worth mentioning in their capacities as writers. William Edward Burchardt Du Bois is a negro writer of merit. Much biographical work has been done round such personalities as Abraham Lincoln and Woodrow Wilson. In philosophy, John Dewey proves himself an ally rather than a disciple of William James, and George Santayana examines life in terms of reason.

The large standard works on American literature are the Duyckincks' *Cyclopædia* (1855: new ed. 1888); Stedman and Hutchinson, *Library of American Literature* (11 vols. 1887–89); *History of American Literature*, (excluding living authors) ed. Trent, Erskine, Sherman, van Doren (4 vols. 1918–21: abridged ed. 1 vol. 1924). There are smaller general histories by Nichol (1882), Richardson (1887–88), Wendell (1901), Trent (1903), Woodberry (1903), and various works by the last-named. See also Tyler, *History of American Colonial History* (1879), and *Literary History of the Revolution* (1897); Stedman, *Poets of America* (1885), and *American Anthology* (1900); Brownell, *American Prose Masters* (1910); A. Lowell, *Tendencies in Modern American Poetry* (1917); Perry, *American Spirit in Literature* (1918); Hornblow, *History of Theatre in America* (1920); L. Untermeyer, *Modern Anthology* (1921), and *American Poetry since 1900* (1924); Manly and Rickert, *Contemporary American Literature* (1922); van Doren, *Contemporary American Novelists* (1922), and other works. See also the separate articles on the principal authors.

Units, in scientific language, are the arbitrarily chosen standards in terms of which different quantities are expressed. The idea is familiar in common life. No commercial transaction can be carried out without a clear understanding as to the units employed. The pound, the yard, the mile, the acre, the gallon, the hour, the dollar, and so on,

are examples of ordinary units, which have become more and more definitely fixed as civilisation advanced. In these days of scientific exactitude great care must be taken in fixing the units of commerce and in determining the ratios of the units used in different countries for the same commodities. Thus the English pound has a definite relation to the French kilogramme, and the yard to the metre. The relations between money units vary, however, for the reason that the value of money depends on fluctuating commercial conditions. See WEIGHTS AND MEASURES, MONEY, EXCHANGE, BIMETALLISM, CURRENCY.

In science we distinguish fundamental and derived units. The fundamental units are so named because in terms of them all other physical units can be expressed. It has been found convenient to take the units of length, mass, and time as the fundamental units; and the centimetre, gramme, and second have been accepted in this sense by the whole scientific world. As thoroughly scientific a system can of course be based on any other chosen units, such as the foot, pound, and second. From these fundamental units all others are derived by definition. Thus the scientific unit of surface is the square, and the unit of volume the cube, whose side is the unit of length. The English acre and gallon, which have no simple relation to the inch, foot, yard, or mile, are essentially unscientific. Other scientific units, such as those of velocity, force, work, involve in their definitions two or all of the fundamental units. Then a growingly important set of derived units are those of electrical and magnetic quantities, such as the ampere, the ohm, the volt, the watt, and so on. In the accepted scientific system, called for brevity the C.G.S. (Centimetre, Gramme, Second) system, one great merit is its purely decimal character. By an extension of the French method of prefixes (*centi*, *deci*, *kilo*, &c.) we are supplied with an unlimited stock of unit-names. Thus the microfarad is an electric capacity which is one-millionth of the farad, and the megadyne a force equal to one million times the dyne or C.G.S. unit of force. Without such prefixes we should have to use at times either very large or very small numbers; they serve, indeed, the same function as a change from inches to miles, or tons to pounds. A general discussion of the significance of units is given in all our best modern text-books on the various departments of physics. See also Everett's *Units and Physical Constants* (3d ed. 1891); and see ELECTRICITY, FORCE, WATT.

Univalves, molluscs having a shell in one piece, like the Gasteropoda (q.v.), as opposed to Bivalves (q.v.). See also MOLLUSCA.

Universalists, a body of Christians whose distinctive peculiarity consists in their belief that evil will ultimately be eradicated from the world, and that all erring creatures will be brought back to God through the irresistible efficacy of Christ's divine love. This doctrine of Universalism, Restoration, or the Larger Hope is already discussed in the article on HELL (at Vol. V. p. 632), and the names of some of its chief representatives given. The communion bearing this name is mostly an American development, though its foundation is mainly due to the Rev. John Murray (1741–1815), who, having come successively under the influence of Wesley, of Whitefield, and of James Relly, a Universalist preacher in London, arrived in the United States in 1770, and ultimately established a congregation at Gloucester, New Jersey, in 1774. The Tunkers (q.v.) were also Restorationists. But the greatest influence in establishing the Universalist Church was exerted by the Rev. Hosea Ballou (1771–1852), originally a Baptist, born in Richmond, N. H., who taught successively at Dana, Mass., Barnard, Vt., Portsmouth, N. H., Salem, and Boston. Most of these Universalists are also Unitarians, and they hold what are commonly called Pelagian views of sin. The church government is congregationalist. There are between 500 and 600 ministers and about 46,000 members, with several colleges and six theological schools and academies.

See Ballou, *Ancient Universalism* (new ed. 1872); Whittemore, *Modern Universalism* (1830); Thayer, *Theology of Universalism* (1864); and Eddy, *Universalism in America* (2 vols. 1884–86).

Universal Language (or, more correctly, International Language), a language long dreamt of but as yet uninvented, which should serve as a medium of communication throughout the world for commercial purposes, or for educated men. If it could override national prejudices it would ultimately supersede the existing languages. Such schemes have been suggested or partly worked out by many ingenious theorists, as by Urquhart (q.v.), Dalgarno (q.v.), Bishop Wilkins (q.v.), Leibniz (in *De Arte Combinatoria*, sect. 1666), Condorcet (1794), Burja (1818), Stethy (1825), Steiner (1886), and Ro (1906); and may perhaps be said to have been partially realised in Esperanto (q.v.). Volapük (q.v.) had but a short shrift, but both Esperanto and Volapük have had many offshoots (Ido, 1907; Idiom Neutral, 1893; Interlingua, 1908; and many others). Pidgin-English (see Vol. III. p. 194), Chinook, Lingoa Geral, Beach-la-mar, and the *Lingua Franca* of the Mediterranean, are partial but spontaneous and actual efforts in the same direction. See books by W. J. Clark (1907), A. L. Guérard (1922), and Sylvia Pankhurst (1927).

Universals. See NOMINALISM.

Universities. Though analogous institutions may be found in classical times, universities to all intents and purposes may be regarded as the distinctive product of the Christian civilisation. As institutions that grew naturally out of the needs of society, indeed, they date from no special moment, and in their earliest developments are without the domain of history. Even when they had assumed a more or less definite form in the different countries where they sprang up, the fluctuating terms by which they were designated prove the gradual and tentative nature of their growth. Even the best-known designation, university (*universitas*), itself varied in meaning, though in prevailing usage it implied simply a corporation of students and teachers. Other terms, such as 'the schools' (*scholæ*), *studium*, *studium generale*, showed a similar tendency to fluctuate in meaning. Thus *studium generale* was variously used to mean a great central school, a school open to all the world, and a school of all knowledge. As was the case with every important institution of the middle ages, the universities looked to the pope as their great head. The right of founding universities, however, was equally claimed by the emperor; and within their own dominions kings enjoyed the same privilege, though royal foundations did not possess all the advantages of such as held papal or imperial charters. Still, the essential distinction between the mediæval and the modern university is that the former was essentially an ecclesiastical institution, whose aims, studies, and privileges were regulated in strict accordance with the temporal and spiritual interests of the church.

At every period of their existence it may be said that universities have fulfilled a double function in the social order. They have been the great training-schools for the different learned professions,

and they have been the custodiers and exponents of the ideal elements on which society ultimately rests. As the condition of their being, therefore, is to respond to the needs and aspirations of society, the history of universities has of necessity been determined by the revolutions of the human spirit and the changing ideals which men have set themselves to follow. With the Renaissance and the Reformation began a new period in their history; and from the developments of modern science and the increasing complexity of modern life a third period began when a fresh adjustment was needed to meet the ends for which they exist. In these three distinct stages of their development they may be conveniently treated in the following survey.

Though the statement has to be made with certain reserves, it may be said that Italy was the birthplace of the mediæval university. At Salerno in the 9th century there grew up a school whose origin is totally unknown, but which as early as the 11th century was famed throughout Europe for the teaching of medical science. In the 12th century a school of law at Bologna drew crowds of students from every country in Christendom. In the case of both of these schools it would appear that teachers and students drew together solely on the principle of supply and demand; and it remained a distinctive characteristic of the Italian universities that they followed professional as opposed to purely scientific ends. Through certain privileges granted by Frederick Barbarossa in 1158, however, Bologna acquired a definite existence which greatly favoured its prosperous development. In the early middle ages its only rival was the university of Paris; and not even Paris had a greater influence in determining the character of subsequent schools. In aims, studies, organisation, indeed, Paris and Bologna present two distinct types of the mediæval university. Though other disciplines gradually defined themselves into *faculties* at Bologna, its specialty always remained the teaching of the canon and the civil law, while Paris, as we shall see, was identified with another subject, equally one of the great concerns of the middle ages. At Bologna the prevailing aim of the students was to acquire the technicalities of a profession which through the complex municipal life of the Italian cities assured to them both riches and honour. The students who came to Bologna were for the most part men in mature life, and the organisation of the university was largely determined by this circumstance. Coming from all parts of Europe, they in time formed themselves into unions, which eventually became the governing element in the university. By the end of the 12th century these unions may be distinctly traced; and by the middle of the 13th they formed two corporations, known as the *ultramontani* and the *citramontani*, with *rectors* chosen from among themselves and by themselves as their representative heads. As definitively arranged, the external administration of the university was in the hands of the corporations, while the professors directed all matters relating to actual study. In Bologna, as at Paris and Oxford, colleges do not make their appearance till the 14th century, by the later half of which, however, they were already in full bloom. Here we may specially mention the great Spanish college (1364) at Bologna, as being the single specimen of a mediæval college now existing on the Continent. Throughout the middle ages, as has been said, Bologna was one of the two great models which determined the character of later universities. In France, with the exception of Paris, Montpellier, and Perpignan, all the universities (eight in number) were fashioned after the type of Bologna. In the pope's bull which founded it the university of Glasgow is expressly said to be modelled on Bologna; and in Germany, though Paris was mainly kept in view, the Italian university had also its imitators. Before the close of the middle ages Italy possessed as many as twenty-one universities, the majority of which had their origin as late as the 14th century. Modelled on Bologna for the most part, none of them, except perhaps Padua, attained the European reputation of their prototype. As Italy had been the birthplace of the mediæval universities, it was from Italy that the forces came which sapped the foundations on which they had arisen. Out of the Renaissance movement generated in Italy sprang the modern spirit with other aims and needs than mediævalism could meet. During the 14th and 15th centuries, accordingly, the intellectual life of Italy was mainly outside its universities.

The university of Paris sprang up as spontaneously as that of Bologna. As Bologna owed its existence to the study of law, Paris was born of the movement known as Scholasticism (q.v.), which in the 12th century was the absorbing pursuit of the best minds of France. In the opening years of that century the lectures of Abelard, the most famous teacher of his generation, drew to Paris such crowds of hearers that men came naturally to associate that city with the study in which they were most deeply interested. The school attached to the cathedral of Notre Dame appears to have been the nucleus round which the university grew up. It was the chancellor of the cathedral who granted the license to teach, and who remained head of the university till the close of the 13th century, when he was displaced by the *rector*, chosen by a section of the university itself. In contrast to Bologna, the university of Paris was essentially the union of the professors of the different subjects that came to have a place in its studies. In time these disciplines gradually defined themselves into the four *faculties* of law (1213), medicine (1213), arts, and theology—the last being by far the most important of the four, while for two centuries (the 13th and 14th) canon law had no place in the university. The *Nations* of the university also came to make part of its organisation. Originally held together simply by common ties of birth and language, by the middle of the 13th century the students of arts formed four legally constituted bodies known as the nations of France, Normandy, Picardy, and England (afterwards Germany). These four nations, together with the three higher faculties (law theology, medicine), formed what were known as the seven 'companies' of the university; and it was the procurators of the nations and the deans of the faculties with the rector as their president who constituted the university tribunal. As in Bologna, it was not till the 13th century that the system of colleges grew up in Paris. The earliest, as it was by far the most famous, was the Sorbonne (q.v.), founded in 1253. By the end of the 14th century as many as forty colleges, more or less fully equipped, had been founded; and by 1500 there were as many as fifty. The fame of Paris rested on its scholastic theology; with the decay of that study, therefore, it gradually lost its place as the first school in Europe. By the middle of the 14th century it was already noted that she no longer produced the most famous thinkers, or published the most famous books; and when in the opening years of the 16th she rejected the new studies of the Renaissance she alienated all the men with whom the future lay. In the great schism, also, by giving her support to the popes at Avignon, she eventually forfeited the favour of Rome, which thenceforward did its best to encourage rivals even in France itself.

There were other mediæval universities hardly inferior in repute to Paris and Bologna. Sala-

manca, founded in 1243, was the glory of Spain for nearly five hundred years, though in the peninsula itself it had several competitors, such as Seville, Alcalá, Madrid, and Coimbra (or Lisbon). The university of Oxford, however, was the most formidable rival of Paris, and in that very branch of study to which Paris owed its fame. Like the great French and Italian universities, Oxford was a spontaneous growth, whose beginnings cannot be determined with precision, for the story of its foundation by Alfred the Great is now set aside as a legend. In the 12th century, however, Oxford certainly possessed a school, which by the middle of the 13th disputed the palm with Paris both in reputation and in the number of its students. Though to a certain extent standing outside the line of development of the two great continental universities, in its aims, the character of its studies, and its organisation it was essentially formed on the type of Paris. In the same century as they grew up in the French university colleges also arose in Oxford, University College being founded in 1249, Merton in 1264, and Balliol about 1268. Though of later date as a school than Oxford, Cambridge had all the characters of a university as early as 1233. Unfortunate in its earlier developments, however, it was not till a later date that it held its own with its sister university. As was the case with the other universities, the prosperity of Cambridge was materially increased by the growth of colleges, of which the first, that of Peterhouse, was founded by 1286. According to Döllinger, it is an illustration of the practical talent and the political freedom of England that she did not squander her resources in founding other universities besides these two, thus avoiding the needless multiplication of schools which we find in the various continental countries. During the middle ages three Scottish universities, and an abortive one in Ireland, complete the list of schools in the British Islands. The attempt to found a university in Dublin in 1312 came to nothing, for the modern university dates only from 1592. Of the three Scottish universities, St Andrews, Glasgow, and Aberdeen, founded respectively in 1411, 1450, and 1494, St Andrews and Aberdeen attained a prosperity fully proportioned to the resources of the country; Glasgow, on the other hand, was a failure for fully the first century of its existence. Germany, whose universities have held the first place in the 19th and 20th centuries, played a subordinate part in the development of studies during the middle ages. The oldest university within the empire, that of Prague, founded in 1348 on the model of Paris, at first gave promise of a brilliant history; but the religious wars of Bohemia in the first half of the 15th century proved disastrous to its continued efficiency. Next in date comes Vienna, but, bound as it was to the old ways of scholasticism, at too late a period (1365) to attain the vigour of the earlier universities. Before 1500 there were as many as fourteen German universities, but mostly organised on the model of Paris, which by the 14th century, as we have seen, was already an outgrown institution. The university of Cracow in Poland (1364) grew to such fame during the 15th century that it may be fairly classed among the greater mediæval institutions. Louvain (1426) and Cologne (1388) were also schools of high importance, the former especially from the fact that it was one of the first institutions north of the Alps where the new studies of the revival of learning found a home.

It is from the middle ages that all those terms come—bachelor, master, doctor, rector, chancellor, &c.—which still form part of the academic vocabulary. The origin of the terms *rector* and *chancellor* has already been explained; the import of the others may here be briefly noted. Entering first the faculty of Arts, the student after a three years' curriculum took his *diploma* of *bachelor*, and after continuing his course was at the age of twenty-one in a position to take the degree of *master*, which entitled him to the privilege of teaching in the university. The period of study for *license* in the other faculties varied at different times and in different universities, the longest curriculum of all being that of the doctorate in theology, which could not be taken before the candidate's thirty-fifth year.

With the 16th century begins a new epoch in the history of the human spirit. The end of feudalism, the revival of classical antiquity, the breaking away from Rome of a large section of the Christian society were events that went so deeply into the life of Europe that the ancient universities could not be left untouched by the revolution. But great historical institutions do not readily respond to new aspirations or adapt themselves to novel conditions. To change their subjects of study and reorganise their constitutions meant for the universities the transformation of their very being. As it happened, few of them consented to the transformation, while others made such partial concessions as utterly failed to meet the new conditions. Thenceforward the universities no longer filled their former place in the mind of Europe. Through the rending of the peoples that came of the Protestant revolution they could no longer be metropolitan schools such as Bologna and Paris had been in the middle ages. But even in their respective countries the universities were no longer the exclusive homes of serious intellectual effort. In certain countries, indeed, their course of study remained what it had been from the beginning, and the most important work was done outside their walls. A brief sketch of the history of the universities since the close of the middle ages will bring this very clearly before us.

In Italy the religious revolution was never a serious menace to the authority of Rome. On the other hand, by the beginning of the 16th century the movement of the Renaissance threatened her with moral disintegration and the substitution of the pagan for the Christian spirit. In the second half of the century, however, came the Catholic reaction; the spirit of humanism was sternly repressed; the universities passed completely under the control of the church, and till the last years of the 19th century remained institutions without any real life, unstirred by any breath of enthusiasm, and powerless to influence the development of the people. A similar history has to be told of the university of Paris. In the first half of the 16th century it rejected the new studies of the Renaissance, and thus fell behind at the very opening of the new era. In the second half the wars of religion brought such disaster to its schools as could never again be wholly repaired. During the following centuries the successive kings of France dictated her studies, controlled her administration, and brought her to such a pass that the Revolution swept her away with other effete institutions.

The universities of England gave a better welcome to the new studies; but to both of them the Reformation, and specially the religious changes under Edward VI., brought such loss of prestige and efficiency as affected their standing throughout all their subsequent history. With the exception of Sir Thomas More, England had no scholar of European importance throughout the 16th century. In the century that followed it was as political rather than educational centres that the universities influenced the movement of things in England; and to what estate they had come in the 18th century the testimony of Gibbon as to Oxford, and the poet Gray as to Cambridge, leave us in no

manner of doubt. Throughout the same period the universities of Scotland, in proportion to their humbler scale, served far more efficiently their purpose as national institutions. The Scottish reformers set about the work of organising public instruction in a more serious spirit than their contemporaries in England. Many of their schemes miscarried; but they left a stamp upon the universities which for good and evil they have retained ever since. Under Andrew Melville during the later half of the 16th century Glasgow attained a reputation which drew students in considerable numbers from different parts of the Continent. The college of Edinburgh, founded by James VI. in 1582, steadily grew in importance through all the following century. In the first half of that century, however, the university of Aberdeen produced a succession of scholars, 'the Aberdeen doctors,' who for the time made it the first of the four institutions which Scotland now possessed. During the 18th century the lustre of her mathematical school under the Gregorys, and her medical school under the Monros, won the precedence for Edinburgh, and made her known wherever intellectual interests flourished. But the special service of the universities of Scotland has been to supply the want of those secondary schools which the reformers sought to make part of their national system of education, but failed to achieve through the poverty of the country and the selfishness of the leading nobility. Under the existing circumstances this was the highest service the Scottish universities could have done to the country; but with the growth of knowledge during the 19th century this function gradually disabled them from adequately meeting the modern conception of a fully equipped university.

As we should expect, public instruction was nowhere more radically influenced alike by Reformation and Renaissance than in Germany. The result of the Lutheran revolt was the establishment of a succession of universities, such as Wittenberg (1502), Marburg (1527), Königsberg (1544), Jena (1558), and Altorf (1578), where the new religion as well as the new studies should find a home, and form centres of instruction for the Protestant communities. But the religious controversies issuing in the Thirty Years' War proved fatal to Protestant and Catholic schools alike; and till the close of the 18th century the universities of Germany gave but little promise of the splendid future before them. Since the period of the Reformation the universities of Spain have shared the inanition of the people, and till recent years have pursued the methods and studies of mediævalism with a dogged obscurantism through which no ray of light could penetrate. A notable product of the Reformation was the university of Leyden, founded in 1575 by William of Orange to commemorate the successful defence of the town against the Spaniards. During the 17th and 18th centuries Leyden boasted a line of scholars without a parallel in any other country of Europe.

During the centuries that followed the Reformation the universities, even those that owed their birth to it, continued to retain the character originally impressed upon them. The essential difference between the typical mediæval university and the university formed by the Renaissance was that, while logic formed the educational staple of the one, the Latin and Greek classics took its place in the other. Through the comparative study of other civilisations men were trained to the bolder handling of tradition, and the scientific spirit gradually displaced that of docile submission to authority. With the growth of the new spirit begins a new epoch in the history of universities, which sooner or later must respond to the needs of the society for which they exist. The characteristics of the modern period are the subdivision of studies necessitated by the widened limits of knowledge, the extraordinary developments of physical science, and the increased complexity of the conditions of modern life. Though more gradual in its working, the modern revolution has affected men's aims and interests more powerfully than the religious revolution of the 16th century. If any proof of this were needed, it would be found in the transformations which the universities have undergone to meet the conditions of the modern time.

Germany, which in respect of its universities took the last place in the middle ages, has in the modern period led the way from the first—the conclusive attestation of its pre-eminence being that its schools alone can now be called cosmopolitan. With the foundation of Halle in 1694, and of Göttingen in 1737, their new start seems to have been made, as both of these schools initiated a movement which gradually made itself felt throughout the whole of Germany. Yet, as has been said, the German universities have no brilliant record for the greater part of the 18th century; and it was only towards its close that they decisively took the lead of those of other countries. From the settlement of Friedrich Wilhelm Wolf at Halle in 1783 dates the classical teaching which is one of Germany's special claims to honour. Kant at Königsberg, and Fichte and Schelling at Jena, at the close of the 18th and the beginning of the 19th century, revived that application of dialectics to abstract thinking which was the distinguishing characteristic of the middle ages. But above all the foundation of Berlin University (1810) by Wilhelm von Humboldt made an epoch in the history of universities, from which we may date the ideal of a national school organised to meet the highest aims of the modern spirit. At present Germany possesses 23 universities with an average roll of over 2500 students. Their expenditure is met largely by the state. For every teacher in the German universities the average number of students is 13. The professors are appointed by government, and are of three grades—full professors, extra-ordinary professors, and *privat-docents*. It is in virtue of their splendid organisation, based as it is on an equally comprehensive system of secondary schools, that the universities of Germany have left all others behind in the fame of their teachers and their contributions to the sum of knowledge.

In France from the abolition of the university of Paris at the Revolution till steps were taken in 1896 for its restoration, the organisation of higher education was peculiar, the term 'university' being synonymous with the national system of higher education. Controlled by the minister of Public Instruction, this system included the faculties of theology, law, medicine, science, and letters established in the leading cities of the country. Since 1897 the local groups of associated faculties have been called universities. France possesses seventeen universities. The Spanish universities mostly follow the French model, but have played no part in the developments of modern thought. In connection with the universities of Italy, of which it is specially noteworthy that the mediæval system of colleges is completely extinct, it now holds good in modern times as of the middle ages, that the professional aim prevails over that of pure science. The country, however, is well provided with universities. Holland follows the German model; it has some half a dozen universities, one of them (Leyden) of world fame. A marked feature of recent years has been the increase in the number of universities in south and east Europe since the

World War. Russia, which had 10 universities in 1913, had in narrowed territory 23 in 1920, besides a number of institutes specialising in particular branches of study.

Like that of other countries, university education in the British Islands was powerfully influenced by new forces. The two historic universities, Oxford and Cambridge, have responded to modern needs by such changes as the abolition of religious tests, the admission of women to university privileges, the diversion of a certain proportion of their endowments to physical science, the system of local examinations, and university extension lectures. The foundation of colleges and universities in certain of the large towns of England is the result of the same tendencies. Durham University (1832), with its physical science college at Newcastle; the universities in Manchester, Liverpool, and Leeds, till 1903 colleges of the Victoria University; the universities of Birmingham (1901; a development from Mason College, founded in 1875), Sheffield (1904), and Bristol (1909; a college since 1876); the colleges of Cardiff, Bangor, and Aberystwyth (organised in 1894 as the University of Wales, the college of Swansea being added in 1920); the university of Reading (founded 1892; a university college until 1926); and the university colleges of Nottingham (1881), Exeter (1901), Southampton (1902; previously the Hartley Institution), and Dundee (part of St Andrews University) are modern. London University is now a teaching body. In the later history of the Scottish universities the Universities (Scotland) Act of 1858 is specially noteworthy as having assigned a common constitution to all of them. The multiplication of lecturers, as distinct from professors, the recasting of the curriculum, the admission of women, the choice of subjects permitted to the student are among the most important changes of recent years in the programme of the Scottish universities. In Ireland the wants of the country are met by the University of Dublin, the National University of Ireland (1909) with colleges in Dublin, Cork, and Galway, and the Queen's University of Belfast (1909). Advocating a teaching university in London, in addition to institutions the city already possessed, T. H. Huxley thus expressed the difference between the modern and the mediæval ideal of the university. 'The student to whose wants the mediæval university was adjusted looked to the past and sought book-learning, while the modern looks to the future and seeks knowledge of things.' The distinction here made is more trenchant than just, but it suffices to show the distance that has been travelled since Paris with its scholastic theology was the first school in Europe.

Canada possesses about a score of universities. The chief are the university of Toronto; McGill University, Montreal; Dalhousie University, Halifax; the university of Manitoba at Winnipeg; Montreal University (formerly a branch of Laval University, a Roman Catholic foundation, situated at Quebec). The Canadian universities follow the models set by Oxford, Edinburgh, France, and the United States. Australia has six universities, the chief being those at Sydney, Melbourne, and Adelaide, all three possessing medical schools of considerable repute. The university of New Zealand has branches in Dunedin, Christchurch, Auckland, Victoria. The university of the Cape of Good Hope (founded 1873) was transformed in 1918 into the federal university of South Africa, which embodies university colleges at Bloemfontein, Wellington, Grahamstown, Pretoria, Pietermaritzburg, and Potchefstroom (added in 1921). There are also the university of Cape Town (until 1918 the South African College), the university of Stellenbosch (the former Victoria College), and the university of Witwatersrand (1922). In the United States the titles university and college are used indifferently, the former occasionally even for a college where the course of study is not advanced, and either title for a university in the European sense, with several faculties. A considerable proportion, therefore, of the 900 'colleges' of the republic are universities, whilst a still larger number are simply high-schools. In the best universities, it should be noted, the course of study will bear comparison with any British university at least; elective and post-graduate courses have been introduced in many of the larger colleges. A state university is part of the educational system of most states, and is generally, like most of the newer colleges, open to both sexes. Most of the American colleges, the state universities excepted, were founded as religious institutions, their chief purpose being to train men for the ministry; this applies not only to Harvard, William and Mary, Yale, Princeton, and others founded before the 19th century, but also to many of the later western colleges. The university system of Eastern countries has undergone great expansion in recent years. There are in India nine federal universities (i.e. examining bodies composed of teaching colleges), four teaching and residential universities, two state universities (Mysore, Hyderabad), a Hindu university at Benares, and a Moslem university at Aligarh. Hong-kong has a modern establishment with British professors, while China has about a dozen government-supported universities and numerous private and denominational institutions. Japan has five imperial universities and 21 foundations of university rank.

The university extension movement for providing the means of higher education for persons of all classes and of both sexes, engaged in the regular occupations of life, is conducted by lecturers giving courses in various populous centres, conducting examinations, and granting certificates. The movement began with Cambridge in 1872, and has extended to most other universities; Chautauqua (q.v.) maintains a somewhat similar system. For University Settlements, see TOYNBEE.

The 20th century has been marked by a great increase in the number of universities and affiliated bodies, and by an even greater increase in the number of students. Within the universities curricula have been diversified to meet diverse needs, and intensified by a wider adoption of research and post-graduate courses, while through extension courses multitudes are brought within their scope who could never otherwise get a university training. Thus a university education has become less and less the privilege of the few, and, by one means or another, has been placed within the reach of almost all who aspire to it; it has become less and less a hall-mark of condition and more a part of the equipment for an ideal citizenship in a progressive democracy. The university system to-day is not so much a number of isolated centres of learning as a part of the national system of education, whether actually under state control or not. The older universities still lay store by the tradition which the centuries have given them, but much has been done in the various countries (in the way of mutual recognition of degrees, exchange of professors, granting of scholarships tenable at other universities, and co-operation of student bodies) to efface particularism in the universities. An interesting development is seen in the periodical congresses of the universities of the British empire and the establishment of a bureau of information in London. Although somewhat impeded by the World War, the movement for international co-operation among the universities has proceeded

apace, as is testified by the existence of student federations, summer courses, international university conferences, and the League of Nations committee on intellectual co-operation. The ideal of an international university, however, is as yet unrealised.

See EDUCATION. The more important universities have separate articles, or sections in the articles on the towns where they are found; and the articles on the several countries deal with the university system of each.

See Denifle, *Die Entstehung der Universitäten des Mittelalters bis 1400* (vol. i. 1885); for the university of Paris specially, the works of Du Boulay, Crevier, Thurot, and Jourdain; J. Conrad, *German Universities for the last Fifty Years* (Eng. trans. 1885); Georg Kaufmann, *Die Geschichte der Deutschen Universitäten* (1888–96); F. Paulsen, *Geschichte der gelehrten Unterrichts* (1906); S. S. Laurie, *Lectures on the Rise and Early Constitution of Universities;* for Oxford, Anthony Wood, Parker, Maxwell Lyte; for Cambridge, Dyer and Bass Mullinger; Grant, *The Story of the University of Edinburgh; Monumenta Almæ Universitatis Glasguensis;* Spalding, *Fasti Aberdonenses;* Lyon, *History of St Andrews;* Hastings Rashdall, *The Universities of the Middle Ages* (1892); and works on American universities by Thwing, Baker, and Caullery. Information regarding the teachers and faculties of all the universities in the world is given in the *Minerva Jahrbuch;* while the *British Empire Universities Year-book* (annual) deals in particular with British universities and in general with the more important foreign ones. See also A. P. Newton, *Universities and Educational Systems of the British Empire* (1924), and W. H. Draper, *University Extension: A Survey of Fifty Years, 1873–1923* (1923). Interesting general studies of the functions of universities will be found in Sir William Hamilton's *Discussions*, Mark Pattison's *Suggestions on Academical Organisation*, Matthew Arnold's *Schools and Universities on the Continent*, and Döllinger's *Akademische Vorträge*, vol. ii.

Unleavened Bread. See PASSOVER, HOST.

Unna, a town of Prussia, once a Hanse town, in Westphalia, 15 miles E. of Dortmund. Near by are the salt-works of Königsborn. Pop. 17,300.

Unreason, ABBOT OF. See FOOLS (FEAST OF).

Unruh, FRITZ VON, German playwright, born at Coblenz in 1885, served as cavalry officer in the war of 1914–18, becoming latterly an ardent pacificist. His dramatic pieces, dominated by the prevailing expressionism, include *Offiziere*, *Louis Ferdinand, Prinz von Preussen*, *Ein Geschlecht*, *Platz*. His other works comprise poems and sketches, notably the *Opfergang* collection.

Unsoundness. See WARRANTY.

Unst. See SHETLAND.

Unterwalden, one of the four 'Forest Cantons' of Switzerland (q.v.), forms part of the hill country which surrounds the Lake of Lucerne; area, 295 sq. m.; pop. (1920) 31,523. Unterwalden is divided into two parts, Upper and Lower; the capital of the Nidwald is Stanz, and of the Obwald Sarnen. See Sowerby's *Forest Cantons* (1892).

Unyanyembe, a district of Tanganyika Territory, between Lake Tanganyika and the coast.

Unyoro, district of Central Africa between Buganda and the Albert Nyanza, forms part of the British Protectorate of Uganda.

Upanishad. See BHAGAVAD GÎTÂ, VEDA.

Upas (Malay, 'poison') is the name given to various vegetable poisons in the Indian Archipelago, including some kinds of Strychnos. But that best known under this name is the arrow-poison prepared from the gum that exudes from incisions in the stem of the Antjar or Anchar tree (*Antiaris toxicaria*), a large tree belonging to the Moraceæ. The portentous tales current in Europe, especially towards the end of the 16th century, and set forth in Erasmus Darwin's *Loves of the Plants*, are mostly baseless inventions—as for example that the atmosphere for miles round a upas tree was deadly to all animal life, and that no other vegetation could flourish near one. It is true that when a tree is felled or its bark much bruised an effluvium issues acrid enough to cause cutaneous eruptions. And it has been suggested as an explanation of the fantastic stories that upas trees grow in a Javanese valley where carbon dioxide, in quantities dangerous to animal life, issues from the volcanic soil, as it does in the Grotta del Cane. But the tree has no such powers.

Upernivik. See GREENLAND.

Upheaval and Subsidence are terms applied to movements of the earth's crust that result in more or less permanent changes of level. Such movements are believed to be due to the sinking in of the crust upon the cooling and contracting nucleus. The crust under such conditions is necessarily subjected to great crush and strain, from which it gets relief, it is thought, by wrinkling—the wrinkles running in linear directions—or by bulging up over much broader areas. Hence two kinds of movement are recognised—(*a*) *linear* or *axial*, to which mountains of elevation owe their origin (see MOUNTAINS), and (*b*) *regional*, affecting broad areas, over which the crust seems to rise or, as the case may be, to sink without much disturbance or tilting of strata, although these may often be more or less fractured and dislocated. Such earth-movements are believed to take place very slowly and gradually as a rule. These are the generally received views; but of late years doubt has been expressed as to whether regional elevation of the crust is possible. The only movements of elevation of which we have obvious evidence are those that give rise to mountain-chains. These movements are *tangential*—the crust is squeezed and puckered up in rapid folds—but a *vertical* uprise of a continental area seems to Professor Suess and others impossible. Probably many of the supposed evidences of regional elevation really point to sinking of the crust under the great oceanic basins. These basins, there is reason to think, are pre-eminently subsiding areas, and if this be so the mere withdrawal of the sea from the continental areas must produce an apparent elevation of the land. Some now begin to suspect, however, that changes of sea-level may also be due to other causes. Thus, Professor Suess—believing that in equatorial regions the sea is upon the whole gaining on the land, while in other latitudes the reverse appears to be the case—points out that this is in harmony with his view of a periodical flux and reflux of the ocean between the equator and the poles. Dr Schmick also thinks that the apparent elevations and depressions of continental areas are the result of secular movements of the hydrosphere, but the sea according to him attains a high level in each hemisphere alternately—the waters being at present heaped up in the southern hemisphere. Others again, as Dr Hilber, have suggested that sinking of the sea-level may be due in part at least to absorption. This recalls the view of Celsius (q.v.), who attributed the retreat of the sea from the coasts of Sweden to gradual desiccation. At present none of the hypotheses that would attribute change of sea-level to secular movements of the hydrosphere has found favour with British geologists, who continue to maintain that all such changes are the result of upheaval and depression of the lithosphere caused by subterranean action. The facts of geodesy and geology give strong support to the modern theory of *isostasy*, which implies that the earth's crust rests approximately in equilibrium upon a heavier substratum which yields slowly to stresses and acts through long geological periods as if it were a liquid. Elevated areas are raised because they

are of lighter material than the adjacent lower lying masses, and float in equilibrium on the underlying heavier layer. But much uncertainty remains regarding the mode of operation of isostasy.

Upolu. See SAMOA.

Uppingham, a town of Rutland, 2½ miles WNW. of Seaton by rail (1894), 12 SW. of Stamford, and 83 NNW. of London. The parish church, of which Jeremy Taylor was rector, was restored and in great part rebuilt in 1861; but the feature of Uppingham is its public school, founded in 1584 by Robert Johnson (1540–1625), from 1591 Archdeacon of Leicester. With an endowment of only £1000 a-year, it owes its development from a mere grammar-school to Edward Thring (q.v.), its headmaster from 1853 to 1887. He found it with only twenty-five boarders, and left it with 330; and to him was due the building in 1863, from designs by Street, of the great schoolroom and the decorated chapel, as also of the gymnasium, swimming-bath, &c. See the life of Thring by Parkin (1898), and the Uppingham School Roll (3d ed. 1906).

Uppsala, the historic centre of ancient Sweden, the principal and last stronghold of heathenism in that country, and still one of the most important towns in Sweden, stands on a little stream that runs down to Lake Mälar, 41 miles by rail N. by W. of Stockholm. Its existing importance is due to its being the seat of the primate, the only archbishop of the Swedish church, and of the principal university. The cathedral, built of brick in the Gothic style, was founded in 1289, completed in 1435, partly burnt down in 1702, and completely restored only in 1893. It contains the tombs of Linnæus, of Swedenborg, and of Gustavus Vasa and some other Swedish kings, and has some fine stained glass. The university, founded in 1477, though new buildings were erected 1879–86, has a great library (1620) rich in MSS., an observatory, botanical garden, and various scientific collections. In the older town, around which on the east and north new suburbs have been built, there stands the castle of Gustavus Vasa (1548). Pop. (1920) 29,081. About three miles to the NE. lies OLD UPPSALA (*Gamla Uppsala*), where are three vast tumuli of the ancient legendary kings. The seat of the archbishopric was here from 1164 to 1270.

Upton, a village 9 miles from Doncaster, where work began on a valuable coal-field in 1927.

Ur. An ancient city of Southern Mesopotamia, famous as the birthplace of Abraham. In 1854 J. E. Taylor, on behalf of the British Museum, excavated part of a group of mounds called by the natives Muqayyah, lying ten miles east of the Euphrates and 110 miles up river from Basra, and found inscriptions which identified the site as 'Ur of the Chaldees.' Further excavations were carried out for the British Museum in 1918 and for the Joint Expedition of the British Museum and of the Museum of the University of Pennsylvania in the years 1922–27, and are still in progress.

The city was founded very early in the history of the alluvial plain, the inhabitants being probably from the first a mixture of Semites from the western desert and Sumerians, who came into the valley from the east, and introduced a civilisation much superior to that of the Semites, over whom they ruled. These Sumerians were a people of Indo-European stock (Caucasian); their original habitat is unknown, but at a later date they had a branch settled in north-west India, and the magnificent painted pottery made by them is akin to that found at Susa and other Persian sites.

The date of the first settlers and the painted pottery is unknown, but by 3500 B.C. Ur was a wealthy city, and its people had reached a height of culture unequalled in subsequent periods: in the working of metals especially, gold, silver and copper, they exhibit a skill in technique and an artistic sense which proves them to have been far in advance of contemporary Egypt. About 3100 B.C. Mes-anni-paddi founded a dynasty of kings of Ur, which ruled the whole of Mesopotamia for 177 years. This period of greatness is illustrated by a series of rich graves discovered at Ur, and by a small temple at al 'Ubaid, near Ur, dedicated by A-anni-padda, the son of the founder of the first dynasty, to the Mother Goddess Nin-Khursag, a building enriched with remarkable statuary in copper and with mosaics.

After a period of subjection to other city states Ur regained the suzerainty of Mesopotamia under Ur-Nammu (*c.* 2300 B.C.), who founded the third dynasty of Ur. His chief extant monument is the huge Ziggurat or staged tower, which was to Ur what the Tower of Babel was to Babylon; it was a great mass of solid brickwork, 210 feet long by 140 feet wide, rising in steps to a height of 54 feet, and crowned by the particular shrine of Nannar, the moon god and patron deity of Ur. Fragments of a sculptured stone slab show the king receiving in a vision, like David, the god's order to build his temple, and the workmen labouring at its construction, and further record Ur-Nammu's victories in war, his sacrifices, and the canals which he dug. Most of the great buildings of this king and of his sons were destroyed by an Elamite raid about 2200 B.C. The overlordship of Mesopotamia passed to the cities of Isin and Larsa, but the kings of these were active in rebuilding the old capital, and the existing ruins preserve more of their work than that of any other period, so that it is possible to obtain a very fair idea of Ur as it was in the days of Abraham (*c.* 2000–1900 B.C.). The Ziggurat stood in the west corner of the Sacred Enclosure, which was the temple complex dedicated to Nannar; in front of the triple staircase leading up it lay the lower temple of the god; by this was a smaller shrine of the god and his wife, Nin-Gal; south-east of the tower was the fortress-like temple of Nin-Gal herself, then a row of small sanctuaries dedicated apparently to the gods of the underworld, and at the south-east end of the enclosure the old palace of the third dynasty kings, now perhaps disused. The temples were massively built of brick with arched doorways and vaulted roofs, simple externally but adorned inside with mosaics and statuary. Outside the Sacred Area lay the town proper, with two-story brick houses built each round a courtyard; on the ground floor were the public rooms and the domestic offices; above, reached by a staircase and a wooden gallery running round the court, the rooms where the family lived: in many houses there would be a chapel, beneath whose pavement lay the family burial vault. The houses are astonishingly modern, and their ruins show that town life in Abraham's time possessed all the amenities of civilisation.

As a result of a rebellion against Babylon Ur was laid waste in about 1900 B.C., and recovered very slowly from the disaster; its temples were not restored to anything like their former grandeur until 1400 B.C., when Kuri-Galzu of Babylon undertook a thorough work of reconstruction. After this came another long period of neglect; political interest had shifted to the north, probably the agricultural importance of Ur was already dwindling, and only occasionally was it worth a king's while to court popularity in the south country by repairing a temple in the old religious capital. It was probably this motive that induced the Assyrian rulers of the 7th century to rebuild some of the shrines of Ur, but the work done by Ashurbanipal's governor was of a very shoddy sort compared with that of the old native kings.

Then, about 600 B.C., Nebuchadnezzar started on a wholesale reconstruction, which was carried on by Nabonidus, the last king of Babylon. The ancient Ziggurat was restored; Belshalti-Nannar, sister of Belshazzar, was appointed high priestess of the moon god, and Nebuchadnezzar built for her a great convent, which took up a large portion of the Sacred Area; the Sacred Area itself was surrounded by an enormous wall of crude brick, and the moon god's temple reassumed something of its former magnificence. This prosperity was short-lived. Babylon fell, and though Cyrus the Great showed his impartiality by restoring Nannar's shrine just as he did that of Jehovah, he was more keen to destroy the monuments of his fallen enemy Nabonidus than to rebuild. A few generations later the Persian rulers adopted Zoroastrianism; Ur, which had long been living on its reputation as a centre of the old faith, had no more reason for existence; its temples were destroyed by the iconoclasts, its houses deserted; its lands, ruined by the shifting of the Euphrates' course and the consequent failure of its canal system, fell out of cultivation, and from 350 B.C. until the present day Ur has been uninhabited.

Uræmia. When excretion of waste products from the body by the kidneys is defective, particularly therefore in cases of Bright's disease (see under KIDNEYS), peculiar symptoms, mostly cerebral, are met with, which are commonly called *uræmic*. Among the most characteristic are fits like epileptic seizures, delirium, tremors or spasms of muscles, transient attacks of blindness, dyspnœa, itchings, vomiting. In some cases it is to the failure in excretion of waste products by the kidneys, in other cases to dropsy of the brain, that these symptoms are due, which, though not infrequently recovered from, are always cause for grave anxiety.

Uragoga. See IPECACUANHA.

Ural, a river of Russia, rises on the east side of the Urals in the Bashkir Republic, and runs mainly southwards for 1400 miles into the Caspian Sea, being practically the boundary between Europe and Asia. It gave name to a province, URALSK, which lay mainly east of the river and north of the Caspian, belonging to the Steppe-region (see RUSSIA), now part of the Cossack (or Kirghiz) Republic.

Ural-Altaic, a term given to a racial and linguistic group of peoples of the Mongolic stock, classified at ASIA, p. 499, and PHILOLOGY, pp. 100–1. See also TURKS.

Ural Mountains, separating European Russia (physically though not politically) from Siberia, have been described at RUSSIA, Vol. VIII. p. 840. The main axis of the series of ridges and plateaus consists of granite, diorite, syenite, porphyry, and schistose rocks. The mineral wealth is great, comprising gold, platinum, silver, copper, iridium, osmium, and iron, besides precious stones, malachite, &c. All the platinum of Russia is found here, and some two-thirds of its pig-iron. Uralite, found here and in Connecticut, is a variety of amphibole formed from pyroxene, with the crystalline character of augite and the cleavage of hornblende; and the name has also been given to a fire-proof building material composed of asbestos fibre with chalk and sodium silicate, &c.

Uralsk, a town of Russia, in the Cossack Republic, on the Ural, 280 miles N. of its mouth in the Caspian Sea; a Cossack centre, trading in horses, fish, and caviare; pop. 33,000.

Urania. See MUSES.

Uraniborg, or URANIENBURG. See BRAHÉ (TYCHO).

Uranium (sym. U; atomic weight 238·5; atomic number 92) is a very hard but moderately malleable metal, sp. gr. 18·7, resembling nickel or iron in its lustre and colour; but in a finely comminuted state occurring as a black powder. It is prepared by heating the oxide with sugar charcoal in the electric furnace. The powdered metal oxidises in air and decomposes water, but not if in the massive condition unless heated to a high temperature. It burns brilliantly, and is converted into oxide. It forms two sets of compounds. It is a comparatively rare metal, which never occurs native; its chief source being *Pitch-blende*, which contains from 40 to 90 per cent. of black oxide. The black oxide is used as a pigment for colouring porcelain. The metal is found in the pitch-blende of Saxony, Bohemia, and Cornwall; its isolation in a pure form is due to Peligot in 1842; but it was not obtained in the compact form till 1856. Becquerel's discovery of the Becquerel rays in 1896 showed that certain salts of uranium emitted a new kind of radiation, invisible to the eye, but capable, like the Röntgen rays, of traversing metals and other bodies opaque to ordinary light, and of impressing a photographic plate. It was soon suspected that the mysterious properties belonged not to the uranium, but to the new metals radium, polonium, and actinium, closely associated with uranium, and discovered by the electroscope. It was not till 1903 that M. and Mme. Curie, the discoverers of radium and polonium, succeeded in showing the extraordinary powers of radium in this respect. See RADIUM.

Uranus. See TITANS, PLANETS.

Urari. See CURARI.

Urban, the name of eight popes.—URBAN I. (222–230), an alleged martyr under Alexander Severus.—URBAN II. (1088–99), born near Châtillon-sur-Marne, was originally a monk of Clugny. He was made by Gregory VII. cardinal-bishop of Ostia, and was elected pope in a council held at Terracina in 1088, during the schismatical pontificate of the antipope Guibert, styled Clement III. He laid Henry IV. of Germany under the ban and finally drove him out of Italy, triumphed also by the same means over Philip I. of France, and aroused the crusading spirit by the fire of his eloquence at Piacenza and the Council of Clermont (1095).—URBAN III. (1185–87), Uberto Crivelli, was a Milanese by birth, and consumed his brief reign in a struggle with the Emperor Frederick I.—URBAN IV. (1261–64), Jacques Pantaléon, was a Troyes cobbler's son, the steps of whose elevation were the see of Verdun and the patriarchate of Jerusalem.—URBAN V. (1362–70), William de Grimoard, was a native of Grisac in Languedoc, and had been Abbot of St Victor at Marseilles. On the death of Innocent VI. in 1362 he was elected at Avignon, but set out for Rome in 1367, only to return a few months before his death.—URBAN VI. (1378–89), Bartolommeo Prignani, was born in Naples in 1318, and at the time of his election he was Archbishop of Bari. The French cardinals set up against him the Bishop of Cambray as Clement VII., who took up his residence at Avignon. See ANTIPOPE, and POPE.—URBAN VII., John Baptist Castagna, died twelve days after his election (15th September 1590).—URBAN VIII. (1623–44), Maffeo Barberini, was born at Florence in 1568, and was elected pope in 1623. He supported Richelieu against Austria and Spain, patronised and then persecuted Galileo, canonised Loyola and Philip Neri, and wrote religious poetry.

Urbana, (1) a city of Illinois, adjoining Champaign, has the state university, railway repair shops, &c.; pop. (1920) 10,244.—(2) Capital of Champaign county, Ohio, 95 miles by rail NNE.

of Cincinnati. There are paper, saw, and flour mills, railroad shops, and other factories. Pop. (1920) 7621.

Urbanists. See CLARE (ST).

Urbi et Orbi (Lat., 'to the city and the world'), a form used in the publication of papal bulls, for the purpose of signifying their formal promulgation to the entire Catholic world, as well as to the city of Rome. See also BENEDICTION.

Urbino (anc. *Urvinum Metaurense*), a town of Central Italy, in the province of Pesaro and Urbino, nestling among wooded hills, between the rivers Foglia and Metauro, 50 miles by rail N. by W. of Fabriano, and 19 miles in a straight line SW. of Pesaro. It is a town of narrow, tortuous, steep streets, and is still surrounded by its mediæval walls. The cathedral (the see of an archbishop) was almost entirely destroyed by an earthquake in 1789; S. Domenico and S. Francesco are both Romanesque churches, and S. Giovanni Battista has interesting frescoes of 1416 by Jacopo and Lorenzo Salimbeni of Sanseverino. The houses mostly belong to the 15th and 16th centuries, as the town had little importance after the cessation of the duchy. The theatre, decorated by Girolamo Genga (d. 1551), is one of the earliest in Italy. But the principal building is the magnificent ducal palace (*c.* 1444–82) with a splendid courtyard and staircase, and beautifully sculptured doorways, &c.: it contains the archives, museum, and picture gallery, the latter with important works of the school of the Marches; the library was conveyed to Rome in 1657, and the most important part of it is in the Vatican. The Old Pretender (James Stewart) lived here in 1717–18 and in 1722. Bramante and Raphael were both born here, and the house of the latter is preserved. The town possesses a university (1506) with faculties of jurisprudence and pharmacy (about 200 students). The majolica for which the town was famous for some 150 years from 1475 (see MAJOLICA) is no longer made. Urbino was the seat of a line of independent dukes of the Montefeltro family (which acquired possession of the town about the end of the 12th cent.) from 1474 to 1626, when, on the abdication of the last duke, Urban VIII. took possession of the duchy as a vacant fief; and it belonged to the Papal States until 1860. Pop. (1921) 19,932.

Uredineæ. See FUNGI, p. 43; PLANTS (*Diseases*); RUST.

Urera, a genus of Urticaceæ with powerful stinging hairs and berry-like fruit in which the perianth is fleshy. Argentina produces *U. baccifera* and *U. caracasana*, the former a low tree whose bark yields a fine silky and very durable fibre, the latter a suffruticose plant with long liana-like stems and a fibre very like wool.

Urethra is the term given in Anatomy to the canal by which the urine is discharged from the bladder. Its most common affections are the special inflammatory condition of its mucous lining known as gonorrhœa, and Stricture (q.v.).—For the Ureter, see KIDNEYS.

Urfa, a modern name for Edessa (q.v.).

Urfé. See D'URFEY.

Urga, a town of Mongolia, on the river Tola, stands in a valley in the great Asiatic plateau, 180 miles SE. of Kiakhta, on the trade route to Peking. It is the religious centre for northern Mongolia, has considerable trade, and a population (partly living in tents outside the city proper) of about 30,000, of whom 6000 are Chinese. In and about the town, which is the seat of the Bogdo Khan or chief Lama of the Mongols, there are a large number of Mongolian Lamas.

Urgel, or SEO DE URGEL, a small mountain town of 3178 inhabitants (1920), in the Catalonian province of Lérida, at the foot of the Pyrenees. Its bishops have extensive powers in the adjoining republic of Andorra (q.v.).

Urgenj. See KHIVA.

Urginea. See SQUILL.

Uri, one of the 'Forest Cantons' of Switzerland, forms part of the hill country which surrounds the Lake of Lucerne; area, 415 sq. m.; pop. (1920) 23,973. It consists of one valley, that of the Reuss, through which run the great road, and also the railway, into Italy by the St Gotthard Pass. Uri is almost entirely pastoral; the constitution is a pure democracy (see SWITZERLAND), and the *Landsgemeinde* or community of the people meets annually in May. Uri, which is German-speaking and Roman Catholic, was the first Swiss district to adopt the form of a canton. Altorf, with traditions of Tell (q.v.), is the capital. See Sowerby, *The Forest Cantons of Switzerland* (1892).

Uric Acid. See URINE.

Uriconium. See WROXETER.

Urie. See INVERURIE.

Uriel, or ISRAFIL. See ANGEL; MOHAMMED, p. 249.

Uriel, or ORGIAL. See LOUTH.

Urim and Thummim (Heb.), first mentioned in Exod. xxviii. 30, in connection with the High-priest's breast-plate, were apparently a pair of objects used at critical junctures as a kind of traditional oracle, but could not always be counted on for an answer (1 Sam. xxviii. 6). The LXX. translation of these words is *δήλωσις καὶ ἀλήθεια*; the Vulgate, *Doctrina et Veritas.*

Urine is the fluid which is secreted or separated by the kidneys from the blood, and it is the principal means of removing the worn-out tissues, especially the nitrogenous and saline matters, from the system. It is a very complex fluid, and its composition varies considerably in different classes of animals—among the mammalia mainly in accordance with the nature of the food. The study of its modifications in disease forms a most important branch of medical work.

Healthy human urine, when freshly discharged, is a clear fluid of a bright amber colour, a bitter, saltish taste, and a peculiar aromatic odour. Its normal reaction is acid, and its specific gravity ranges from 1·015 to 1·025. A healthy adult man passes on an average about 50 fluid ounces (2½ pints) of urine in twenty-four hours; but the amount is subject to very great variation, being diminished during sweating or thirst, and increased under the influence of cold, by copious draughts of fluid, and by large quantities of salt or sugar, as well as many drugs. The solid constituents of the daily urine weigh a little more than two ounces, of which about half is urea. The other substances are, in the order of quantity, common salt (sodium chloride), phosphates, sulphates, ammonia, uric and hippuric acids, with others of less importance (mucus, colouring matters, &c.). The amount of solids, and the amount of urea excreted per day, are less subject to variation in health than the whole amount of urine; careful observations of the daily excretion of urea are of special importance in the investigation of disease.

Urea (chemical formula, CON_2H_4) is the form in which the great bulk of the nitrogenous waste of the human body is removed. It is formed in the tissues during the disintegration of protein material, and carried by the blood to the kidneys, which separate it and pass it off in the urine. It is very readily soluble in water; it gives rise to carbonic

acid and ammonia during ordinary decomposition. It is of great interest chemically, being the first animal product which has been produced by synthesis from inorganic bodies without the intervention of animals.

Uric acid, $C_5H_4N_4O_3$, is present in small amount in the blood and in normal urine, chiefly in combination with alkaline bases. It is very much less soluble in water than urea; its presence in excess in the blood is the chief feature of the gouty state. In birds and reptiles, however, the nitrogenous waste is excreted chiefly in this form.

Hippuric acid, $C_9H_9NO_3$, is usually present in still smaller quantity in human urine; but in considerable amount in the urine of herbivora.

Of *abnormal constituents dissolved* in urine the most frequent is *albumen* (see KIDNEYS, DISEASES OF). It causes no change in the appearance of the urine; but is visible as a white precipitate, insoluble in dilute acids, on boiling, or on the addition to the urine of certain reagents (e.g. strong nitric acid, solution of picric acid). *Sugar* is excreted in considerable quantity in Diabetes (q.v.) Mellitus. *Bile* is present in cases of jaundice, giving the urine a deep yellow, brown, or almost black colour. *Blood-pigment* may be present without blood-corpuscles, but more commonly as a result of the escape of blood from the vessels in some part of the urinary tract. It may give the urine either a bright red or a 'smoky' tint.

Urinary Deposits.—When normal urine is allowed to stand in a clear glass vessel for some hours, a faint cloudy deposit appears at the lower part, consisting chiefly of mucus from the bladder. When the urine is much concentrated, as it often is in hot weather, a dense yellow or reddish deposit frequently appears as it cools, readily soluble on heating. This consists of urates, and is generally of no particular importance; but it may be an indication of digestive disturbance. When, from administration of alkalies or otherwise, the urine is alkaline, a white deposit of phosphates may be seen, readily dissolved by acids. If habitually present, it may arise from an unhealthy condition of the bladder. Small red 'cayenne-pepper' grains consist of uric acid, and indicate its presence in excess. Larger particles (gravel) are sometimes passed; if retained in the bladder they lead to the formation of a Calculus (q.v.). Casts of the kidney tubules in Bright's disease, pus from the kidney or bladder, and blood are distinct indications of disease in the urinary tract. They are best recognised under the microscope. Numerous other deposits are occasionally met with, but they are not of any general interest.

Incontinence of Urine, or *Enuresis*, is a troublesome affection, far more common in childhood than in more advanced life, and in boys than in girls. The child may have no bad symptom of any kind that can be detected, but is in the constant habit of discharging its urine in bed during sleep. The act may take place once or several times during the night, and sometimes there is an interval of a night, but seldom more. The child may often be broken off this unpleasant habit by proper domestic management, as withholding any excess of fluids before going to bed, and waking it, and making it discharge the contents of the bladder at the time when the elder members of the family retire to bed. Some hard substance—e.g. a cotton-reel in a towel—fixed over the spine, so as to prevent the little patient from lying on its back, sometimes has a good effect. When such means as these fail, recourse must be had to medical advice. Some slight abnormality in the urinary organs is frequently present, the correcting of which cures the complaint. Cold douches to the spine, combined with the internal use of chalybeates, are frequently serviceable. The remedy most frequently used is a combination of tincture of belladonna in 5 or 10 minim doses, with bromide of potassium, 5 or 10 grains, according to age, taken at bedtime. Thyroid extract is also useful in some cases. The various forms of mechanical pressure that have been suggested, with the view of preventing the passage of the urine, cannot be too strongly reprobated. The same remark applies to the too common practice of punishing the unfortunate child for a condition which is utterly beyond its control, and deserves pity rather than chastisement.

Retention of Urine is the term employed in medicine to signify a want of power to discharge the urine from the bladder, and it must be carefully distinguished from a far more serious affection known as *suppression of urine*, in which also no urine is passed, because in this case there is none in the bladder. Retention may arise from Stricture (q.v.) in any of its forms; from some mechanical obstacle in the urethra, a tumour, calculus, clot of blood, &c.; from enlargement of the prostate gland; from want of power in the bladder; or by reflex nervous influence, either owing to some painful condition in the urinary or adjacent organs, or owing to a hysterical condition in the patient. The patient finds himself unable to pass his water, although he has a great desire and makes strong efforts to do so. The bladder soon becomes so distended that it can be felt as a tense round tumour above the pubes. If relief be not speedily afforded, the bladder may burst, and discharge its contents into the peritoneal cavity, in which case death rapidly ensues; or if the urethra be obstructed, it may give way behind the stricture, when the urine is extravasated into the cellular tissue of the adjacent parts—a condition which, if not promptly relieved by surgical interference, is likely to be followed by gangrene and death.

If the symptoms are not very severe, and there is no evidence of impassable obstruction, a hot bath, combined with some antispasmodic remedy, such as a hypodermic injection or a suppository of morphine with atropine, will often give relief. If these means fail, the urine must be drawn off by a catheter passed along the urethra, an operation often requiring great skill in manipulation. The size, material, and shape of the catheter depend to a large extent upon the nature of the obstruction causing the retention. If this cannot be done, which rarely happens, except when the spasm is associated with old-standing disease of the urethra, the surgeon must either puncture the bladder above the pubes, or make an incision into the urethra either at or behind the seat of the stricture. In cases of enlarged prostate, permanent relief can sometimes be afforded by an operation in which the prostate is removed with subsequent freedom from retention; but in most cases the patient is taught to use a catheter for himself, and thereby prevented from the danger of a recurrence of the retention.

Paralysis of the muscular coat of the bladder may arise from the debility of old age, from the depressed state of the nervous system in severe fevers, from injury or disease of the head or spine, and from various other causes. In a temporary form it is often a result of over-distention of the bladder from stricture or prostatic disease, and it sometimes occurs in the case of nervous sedentary persons, if they have allowed rather more than the usual time to elapse without evacuating the bladder. It should be generally known that retention of urine from paralysis, or even from incomplete obstruction, is sometimes accompanied by dribbling away of the water, so that the retention might at first sight be mistaken

for *incontinence* of urine. On examination, however, it will be found that the bladder is abnormally distended, and cannot be evacuated by the act and will of the patient. In these cases the urine must for a time be regularly drawn away by the catheter. General tonics, such as the cold bath (or sometimes preferably the sitz-bath) and chalybeates, must be given to improve the general health; while medicines which are supposed to act locally on the muscular coat of the bladder or on the spinal cord must be simultaneously administered. A peculiar form of retention sometimes occurs in women of hysterical temperament, in which the will rather than the power is at fault.

Frequent and Painful Micturition may be a symptom of disease of the kidneys, the bladder, or some neighbouring organ, but is very often merely an indication of an abnormally concentrated, acid, and irritating condition of the urine, which causes excessive stimulation of the bladder and urethra. Persons suffering from this affection usually refrain from drinking fluid under the mistaken idea that a diminution in the quantity of urine to be passed will diminish their discomfort. The right course is exactly the opposite; for the more the urine is increased in quantity in such a case, the more its irritating constituents are diluted, and the less pain and annoyance it causes. Free drinking of diluents is often sufficient of itself to remedy the condition.

Strangury (Gr. *stranx*, 'that which oozes out,' *oureō*, 'I micturate') is a symptom of many diseases of the urinary organs (calculus, inflammation of the bladder, gonorrhœa, stricture, &c.). It shows itself in a frequent and irresistible desire to pass water, which is discharged in very small quantity, but causes scalding and cutting pains along the course of the urethra. The pain often extends to the bladder and even to the kidneys, and is sometimes so severe as to implicate the lower bowel (the rectum), and to produce the straining condition known as *Tenesmus*. It may also be caused by irritating substances in the urine, especially by *cantharides* or Spanish flies (whose irritant principle is liable to find its way into the renal secretion, whether the above-named drug is taken internally or merely applied to the skin as a blistering agent), and by oil of turpentine, when administered internally. Treatment must of course be directed if possible to the cause of the condition. But among measures generally beneficial may be mentioned a drachm of laudanum in a wine-glassful of starch mucilage injected into the lower bowel, copious mild mucilaginous draughts (of barley-water, for example), the warm bath, and, if that cannot readily be obtained, hot local fomentations.

Urmia, or URUMIAH, a town of the Persian province of Azerbaijan, 10 miles W. of the Lake of Urmia, in a wide and fertile plain; pop. 40,000. Urmia, the seat of a Nestorian bishop, and of American and Anglican missions, was said to be the birthplace of Zoroaster (q.v.). The Lake (4500 feet above the sea), lying in a depression between the Kurdish mountains and the hills that bound the south end of the Caspian Sea, is about 90 miles by 25, and contains numerous islands. It has no outlet, but has many feeders, some 80 to 150 miles long; the water is intensely salt, on an average only 12 or 15 feet deep, the greatest depth sounded as yet being 40 feet; fish are not found, but plenty of small crustaceans, on which various kinds of water-birds feed.

Urn, any vase; but specially a cinerary urn, the vase of clay, glass, or sculptured marble, in which peoples who practised cremation preserved the ashes of their dead. The forms and patterns in use amongst the prehistoric northern nations differed widely from those found in Roman tombs; nor did any one type prevail even in Rome. See BURIAL, CREMATION.

Urochordata. See TUNICATA.

Urodela. See AMPHIBIA.

Uromastix. See AGAMIDÆ.

Urquhart, SIR THOMAS, of Cromarty, fantastic miscellaneous writer, eldest son of Sir Thomas Urquhart, head of an old family possessed of extensive estates in that county, was born about 1611. He was educated at King's College, Aberdeen, travelled in France, Spain, and Italy, and there (according to his own account) acquired a perfect knowledge of foreign languages and great skill in fencing. On his return he bitterly opposed the covenanting party, took up arms against them in the north, but was worsted and forced to pass to England by sea. Becoming attached to the court, he was knighted at Whitehall, 7th April 1641. The same year he published his *Epigrams Divine and Moral*, dedicated to the Marquis of Hamilton. This contains only three of the ten books he wrote. He brags of having 'contryved, blocked, and digested those eleven hundreth epigrams in a thirteen weeks tyme.' Its speed proves, he thinks, his 'great maturetie and promptness of wit.' But the pieces written in Latin and English, though quaint, have no real merit. On his father's death in 1642 Urquhart found the estate he inherited much encumbered, whereupon, 'I, as I had done many times before, betook myself to my hazards abroad.' Returning after some years, he fixed his residence at Cromarty. Here, though much troubled by his creditors, he produced his *Trissotetras; or a most exquisite Table for resolving all manner of Triangles*, &c. (1645), a curious but useless mathematical treatise.

In 1649 his library, 'compiled (like a compleat nosegay) of flowers, which on my travels I had gathered out of the gardens of above sixteen several kingdoms,' was seized and sold. He took up arms in the royal cause, was declared a rebel by parliament, was present at the battle of Worcester, where he lost most of his MSS., 'seven large portmantles full of precious commodity.' One treatise hastily seized 'by a file of musquettiers to afford smoak to their pipes of tobacco,' was rescued by a friendly officer. Urquhart was removed to London, where through Cromwell's influence he was allowed considerable liberty. There in 1652 he published *The Pedigree* and *The Jewel* (the full titles are too long to quote). The first was an exact account of the Urquhart family, in which they are traced back to Adam. Among his ancestors were 'the sister of Spartus that built Lacedemon, Pharaoh's daughter, and Panthea, daughter of Deucalion and Pirra.' The second is chiefly a panegyric on the Scots nation. Its account of the soldiers and scholars of the period is still of value. In 1653 he issued his *Introduction to the Universal Language*, which 'for variety of diction in each part of speech surmounteth all the languages of the world.' The 'longings of the generous reader' were to be satisfied by fuller treatises which never appeared. The same year we have his version of the first two books of *Rabelais*. The translation of the third was not issued till after his death. This is said to have occurred in 1660 abroad (whither he had escaped), in a fit of laughter on hearing of the restoration of Charles II.

Urquhart's works are a strange mixture. The learning is enormous, yet the scholarship is inaccurate. He is very industrious, yet very slovenly. Crazy with conceit, he yet evinces a true apprecia-

tion of all that is noble. Though a clumsy writer, he has many phrases of quaint felicity, many passages of great power. His rendering of *Rabelais* is an English classic. The extravagance, the grotesqueness, the wild humour, the wisdom of the great Frenchman had a peculiar attraction for the Scottish cavalier. It must be added that he amplifies and lingers over the grosser passages with a gusto there is no mistaking. His extraordinary acquaintance with strange English words is not less remarkable than his command over his author's language.

See his *Works* in Maitland Club Publications (1834). Editions of his *Rabelais* are numerous; that edited by Whibley for the 'Tudor Translations' is in 3 vols. (1900). There is a Life of Urquhart by the Rev. J. Willcock (1899).

Ursa Major, 'the Greater Bear,' and **Ursa Minor,** 'the Lesser Bear,' are two celebrated constellations in the northern hemisphere of the heavens. *Ursa Major* was distinguished as early as the time of Homer by the names *Arktos*, 'the Bear,' and *Hamaxa*, 'the Wagon,' the vivid imagination of the Greeks discovering a fanciful resemblance between these objects and the group of brilliant stars in this constellation. The Roman name Ursa was a translation of the Greek *Arktos;* the Romans also called its seven bright stars the *Septentriones*, 'the seven ploughing oxen,' whence the adjective *septentrionalis* came to signify north. The common names throughout Europe for these seven stars are 'the Plough,' 'Charles's (Charlemagne's) Wain,' 'the Wagon'—evidently derived from the classical epithets above mentioned; the common American name is 'the Dipper.' The remarkable group of stars in the hinder part of the Great Bear, being within 40° of the north pole, never sinks below the horizon of any place in a higher north latitude than 40°, a peculiarity alluded to by Ovid in his *Metamorphoses*. It contains a considerable number of stars, seventeen of which are easily visible to the naked eye; but of these only one (α) is of the first magnitude, two (β and γ) of the second, and eight (among whom are δ, ϵ, ζ, and η) of the third. The accompanying figure shows the arrangement of the seven stars constituting 'the Plough.' α and β are known as 'the Pointers' from their use in detecting the *Pole-star* (q.v.). A line drawn from the Pole-star through η of the Great Bear, and produced its own length, passes close to the star Arcturus of the first magnitude.—*Ursa Minor* is less prominent in the heavens. It was also *Arktos* and *Hamaxa* among the Greeks, but was besides distinctively denominated *Cynosura*, 'the Dog's Tail,' from the circular sweep formed by three of the stars in it. The star α in the extremity of the tail of the Little Bear, at present the Pole-star (q.v.), is the brightest in the constellation, though only of the third magnitude.

Ursa Major and Ursa Minor.

According to a Greek legend Ursa Major was the metamorphosis of Callisto, one of Diana's nymphs, who having violated her vow, and being transformed by her indignant mistress into a bear, was slain by her son Arcas, and afterwards transferred to the heavens as a constellation by Zeus; Arcas being at the same time metamorphosed into Boötes, the Arktophylax, 'Bear-warden,' of the Greeks.

Ursins, Princesse des (1642–1722), was born of illustrious family, and after the death of her first husband, the Comte de Talleyrand-Périgord, married in 1675 Prince Orsini. She was deputed to conduct to Spain Marie-Louise, the bride of Philip V. (q.v.), grandson of Louis XIV., and till 1714 she wielded enormous power at the Spanish court. See works by Cruttwell (in Eng.), and by Saint-René Taillandier (in Fr.).

Urson (*Erethizon dorsatus*), an arboreal spiny rodent about the size of a small hare, distantly related to the porcupine, and often getting that name. It occurs in Canadian forests, and there are related species further south as far as Mexico. Its spines are almost hidden in long hair. The tail is short and stumpy and is used to strike sideways at an enemy. In some related South America genera the tail is prehensile.

Ursula, St, a celebrated saint and martyr of the Roman Calendar (21st October), especially honoured at Cologne, the reputed place of her martyrdom. The legend in its present form is found as far back as the 12th-century *Chronicle* of Sigebert of Gemblours, and fills 230 folio pages in the Bollandist *Acta Sanctorum*. Here Ursula is the daughter of a British king, and is sought in marriage by the son of a heathen prince. She made it a condition that her suitor should become a Christian, and that she should be allowed a space of three years to make a voyage of pious pilgrimage with her maidens, 11,000 in number. She sailed up the Rhine to Cologne, thence to Basel, travelling thence to Rome. Returning to Cologne, the pious virgins fell into the hands of a horde of Huns, who put them all to the sword save Ursula herself, reserved as a prize for the chief. But she demanded to join her companions in martyrdom, and thus the full tale of victims was made up. The centuriators of Magdeburg exposed this ridiculous story; the Jesuit Crombach devoted an entire folio volume to its defence (1647). One explanation offered is that this belief arose from the name of a virgin who was really the companion of Ursula's martyrdom—*Undecimilla*. The record of the martyrdom in the calendar thus being 'Ursula et *Undecimilla VV.*,' 'Ursula and Undecimilla Virgins,' was easily mistaken for 'Ursula et *undecim millia VV.*,' 'Ursula and *eleven thousand virgins.*' Or again the entry might have been 'Ursula et XI.M.V.,' where M. being misread for *millia* not *martyres* gave 'Ursula and 11,000 virgins,' instead of 'Ursula and 11 martyr virgins.' Early in the 12th century the citizens of Cologne in digging foundations for their new walls across the cemetery of the old Roman settlement of *Colonia Agrippina* naturally enough found a large number of bones. These were declared by an ecstatic nun of Schönau, Elizabeth by name, to be the relics of the virgins. Unhappily many of these were soon discovered to be the bones of males, but the nun redeemed the reputation of the virgins by discovering in a series of fresh visions that a pope of the name of Cyriacus, an archbishop, several cardinals, bishops, and priests had been moved by the holiness of the virgins to follow them to Cologne, only to gain for themselves also the martyr's crown. On the other hand, Mrs Tout in the *Owens College Historical Essays* (1902) has pointed out that about 850 A.D. there is already mention of thousands of virgins slaughtered here, and that in the same century a day was set apart for celebrating their memory; and there was already a convent and church of the eleven thousand as early as the 10th century. Schade argued in 1854 that Ursula is none other than a Christianised survival of old German paganism still remembered under the names of Berchta, Hulda; in Swabia, Ursel or Hörsel; and in Sweden, 'Old Urschel.'

See Schade, *Die Sage von der Heiligen Ursula* (Han. 1854); Kessel, *St Ursula und ihre Gesellschaft* (Col. 1863); Stein, *Die heilige Ursula* (ib. 1879); Baring-Gould's *Virgin Saints and Martyrs* (1900); and the *Owens College Historical Essays* (1902).

Ursulines, a female teaching order in the Roman Catholic Church, founded by St Angela Merici of Brescia in 1537, who was born at Desenzano in 1470, died in 1540, and was formally canonised in 1807. She formed at Brescia an association of young women for the tending of the sick and poor, and the instruction of children, and papal confirmation of the order was obtained from Paul III. in 1544. In 1565 a house was opened at Cremona, and St Charles Borromeo brought the order to Milan. In France one of its most distinguished members was the celebrated Madeleine de Ste Beuve, who endowed an Ursuline house at Paris in 1610. Here they first adopted the common life instead of dispersion in various homes. They were introduced into Savoy by St Francis de Sales in 1635. They spread also over Germany, Austria, and in the fullness of time Canada and the United States. An establishment was founded at Edinburgh in 1836, being the first Catholic convent in Scotland since the Reformation.

Urticaceæ, a family of plants with over 40 genera and over 500 species. Bentham and Hooker unite this family with the allied Ulmaceæ (see ELM, NETTLE-TREE) and Moraceæ or Artocarpaceæ (q.v.). The stamens are bent inwards in the bud, and spring out when the flower opens, scattering the pollen, as may be seen in the cultivated artillery-plants (Pilea), or the British species of Nettle (q.v.) and Pellitory (q.v.). Stinging hairs are found in the Nettles, in the tropical Urera, and in the Stinging-trees (Laportea) of Formosa, India, &c. See also BOEHMERIA.

Uruguay (officially, *República Oriental del Uruguay;* formerly known as the *Banda Oriental* or 'Eastern Bank'—i.e. of the Uruguay) is the smallest of the South American republics, although its area—72,110 sq. m.—is nearly four-fifths that of England, Wales, and Scotland combined. Its general outline is that of a pear, the sides marked by the Uruguay River and the rivers and chain of hills which, with the Lagoa Mirim, form the boundary line with Brazil. The Atlantic washes its shores for 120 miles, the Plate and Uruguay for nearly 600 miles. The most important of the numerous rivers of the interior is the Rio Negro, which flows across the central portion. The country is not mountainous, but full of low hills (*cuchillas*), often forming long ranges, the highest reaching only 1650 feet. Gneiss and granite predominate in the north, and elsewhere porphyry and sandstone. Gold and copper mines are being worked, and other minerals more or less abundant are silver, iron, tin, mercury, mica, beautiful marbles, slate, gypsum, cobalt, and columbite; diamonds also have been found in Minas. But little has been done so far to exploit the mineral wealth of the country. Uruguay enjoys on the whole a delightful climate; the temperature normally does not fall below 35° nor rise much above 90° F. The flora includes many useful trees, amongst them the palm, brilliant flowers, and a host of medicinal plants. Of the fauna may be mentioned the jaguar and puma, the wild cat, tapir, deer, rhea, parakeets, humming-birds, plentiful waterfowl in the lagoons, and snakes (rattlesnake, a cross-marked viper, &c.), lizards, and venomous spiders.

The population, estimated at 1,094,688 in 1908, is now 1,662,116. Montevideo, the capital, had a population of 420,000 inhabitants in 1922. None of the other towns exceeds 30,000. There is an annual immigration of about 150,000, but those leaving the country are often nearly as numerous. The bulk of the European immigrants consists of Spanish and Italians. The leading industry is still the raising of cattle and sheep, the latter mainly in the south and west. Six-sevenths of all the exports are embraced under the head of pastoral and saladero produce. The Liebig factory is at Fray Bentos. Uruguay possesses 14,443,341 sheep and 8,431,613 cattle. Not much more than 2½ million acres are devoted to agriculture; the principal crops are wheat, maize, oats, and linseed. The wine industry is of some importance, having an output of over 7½ million gallons. The exports in 1924–5 were a little over 107 million dollars and the imports were over 62 million dollars. The dollar is worth nearly four shillings. The exports are almost exclusively pastoral products, of which wool, meat, and hides are by far the largest items. Several hundred thousand tons of meat are exported annually. The imports are mainly machinery, textiles, coal, oil, timber, and blood-stock. The home manufactures are unimportant. In the year under review the export of wool amounted to 36,777,000 dollars, and that of meat and extracts to 35,475,000 dollars. Uruguay sent to Great Britain produce valued at over 24,000,000 dollars, and imported from Great Britain goods valued at over 11,000,000 dollars. In the last twenty-five years the sea-borne trade of Uruguay has more than trebled.

The constitution, established in 1830, was amended in 1919. The executive is in the hands of the President and the National Administrative Council. The president is elected for four years by direct popular vote. The Council of nine members serves as a check on the presidential power, which used to be excessive. The legislature consists of a Senate and a Chamber of Representatives. There are 19 senators, one for each department, chosen for 6 years, and 124 representatives, chosen for 3 years. The administration of justice, once very defective, has been much improved. The army is a small, well-armed force of 10,000, and the war strength is nominally 50,000. In the event of a serious war a much larger force could be raised. The navy is very small. The revenue and expenditure each amounted to rather more than 45 million dollars in 1924–5. There was a small surplus. The national debt is 191 million dollars. There are about 1600 miles of railways open, nearly all in British hands. There are 4850 miles of telegraph lines. There are more than 1000 public schools, with about 124,000 pupils, and a considerable number of private schools. Montevideo has a university. The religion of the vast majority is Roman Catholic, but church and state are separated and there is complete religious liberty. Uruguay has less literary distinction than most of its neighbours. The most considerable literary man was Francisco Acuña de Figuero (1790–1862), a poet of high order who adhered to the classical school. Alejandro Margariños Cervantes (1825–1893) was both a novelist and poet. His poetic romance of *Celiar* (1852) won him great fame, and the collected poems of *Brisas del Plata* (1864) are instinct with patriotism and local colour. José Enrique Rodó (1872–1917) had as high a reputation as any literary critic in South America.

The early history of Uruguay is chiefly occupied with disputes between Spain and Portugal. In the beginning of the colonisation the Spaniards took comparatively little interest in the Plate territory because it yielded no gold, and, further, Uruguay was retarded by warfare with the fierce Charrua Indians. The early years of the seven-

teenth century are a landmark in its history, for then it was that the wise governor of the River Plate, Hernandarias, brought from Buenos Aires a hundred head of cattle and the same number of horses and mares. Thus was founded the wealth of Uruguay. Some fifteen years later the excellent Jesuit missionaries landed in the country and began the task of civilising the Indians. This beneficent work was greatly hampered by the Portuguese from Brazil, who continually raided the country. In 1680 the Portuguese founded a military settlement at Colonia (now Colon), opposite Buenos Aires, which for a century was a thorn in the side of the Spaniards and gave their enemies great facilities for smuggling. As a counter-move the Spaniards founded Montevideo, which soon became a flourishing city. In 1767 the Jesuits were expelled from South America and Uruguay received some indirect benefit from this disastrous measure; the Indians, who fled from the missions, entered Uruguay and proved useful settlers. In 1776 the Spaniards finally captured the troublesome Colonia and dismantled the fortifications. But the power of both Spain and Portugal was destined to be eclipsed in the wave of unrest which was springing up, and independence was at hand. The events of 1806–7 encouraged the revolutionary spirit. A British force, aiming a blow at Spain, which was then the ally of Napoleon, captured Montevideo. The incompetent General Whitelocke, having been sharply repulsed in an attempt upon Buenos Aires, was seized with a panic and agreed to evacuate Montevideo and leave South America altogether. This success, won over a great power, showed the colonists their strength. The first steps of the Uruguayans in the war of independence were comparatively easy; by 1814 they had expelled the Spaniards from Montevideo. Their leader was the able but half-savage Artigas. A period of confusion followed, both Brazil and Argentina claiming the territory. At last, in 1829, the heroic efforts of the patriots prevailed, the foreigners were expelled, and the history of the Republic of Uruguay begins. Unfortunately the two victorious generals, Lavalleja and Rivera, turned their swords against one another, and for many years the country was distracted by their rival pretensions. Darwin comments on the want of security for life and property in the republic. Out of these feuds sprang the two famous parties of the Colorados and the Blancos, which still disturb the public peace. Uruguay also supported the enemies of Rosas, the Argentine tyrant, and was instrumental in bringing about his fall in 1852. In the 'sixties progress was retarded by the war with Paraguay, in which the Uruguayans helped to destroy another tyrant, the ferocious Lopez. But the demand for pastoral products was bringing wealth into the country and the fierce faction fights were unavailing to check the growing prosperity. But Uruguay retained an unenviable reputation for turbulence. In 1868 President Flores was assassinated. The next twenty years were somewhat more tranquil, and railways were built, and the credit of the country improved. But the curse of civil strife was not allayed, and in 1897 President Borda was assassinated. Outbreaks of disorder were frequent, owing to the attempts of the Blancos to obtain office. In 1904 there was a serious outbreak, but under General Willisman's presidency the improvement was marked and the country became prosperous. In 1909 it was estimated that fifty million sterling of British capital was invested in the republic, chiefly in railways. Uruguay was affected less than its neighbours by the World War; in 1917 diplomatic relations were severed with Germany. During the last few years there has been a considerable amount of progressive social legislation. In 1919 the constitution was amended. Dr José Serrato, president from 1923 to 1927, was succeeded by Juan Campisteguy, and the country seems now to be free from the internal strife which troubled the first seventy years of the republic's existence. The internal troubles, for which Uruguay used to be notorious, were the result of the strife between the Colorados and Blancos. Lord Bryce, who visited the country about 1912, remarks: 'The Whites became in course of time the country party as opposed to the Reds of the town, and especially of Montevideo, and thus, as the city is the home of new views and desires for change, the Reds have become the anti-clerical and the Whites the church party.' He predicted that conditions would improve if the educated people would take more interest in politics, and this desirable state of things has come to pass.

See M. G. and E. T. Mulhall, *Handbook of the River Plate* (5th ed. 1885); V. Arreguine, *Historia del Uruguay* (1892); C. M. Maeso, *Tierra de Promision* (1904); P. F. Martin, *Through Five Republics* (1905); A. H. Keane, *Central and South America* (1909); W. H. Hudson, *The Purple Land* (latest ed. 1911); W. H. Koebel, *Uruguay* (1911); and the *Statesman's Year-book*.

Uruguay River rises in the Sierra do Mar in the Brazilian state of Santa Catharina, within 50 miles of the Atlantic, and flows in a swift course west and south to form with the Paraná the Plate estuary (see LA PLATA). It separates Brazil and Uruguay from the Argentine provinces, and has a course of nearly 1000 miles. It is encumbered by numerous rapids, but it is navigable for vessels to Salto (200 miles), and above this point steamers run as far as Paso San Isidro.

Urumiah. See URMIA.

Urumtsi, URUMCHI, or TIHUAFU, the capital of Sin-Kiang, the Chinese 'New Dominion,' at the northern base of the Tian-Shan Mountains. It is in a fertile district, commands the principal route from Mongolia into Eastern Turkestan, and has a large trade with all the adjoining lands. Pop. 30,000.

Urundi and Ruanda, two districts, formerly in German East Africa, ceded after the World War to Belgium as mandatory of the League of Nations. The districts, which are populated by the Wa-tusi and the Wa-hutu, are rich in cattle. Area, 21,235 sq. m.

Urus (*Bos primigenius*), the Latin name for the extinct wild ox, German Aurochs, which in Cæsar's time (see *Bell. Gall.* vi. 28) was abundant in European forests, and probably survived in Poland till about 1627. It is regarded by some authorities as one of the ancestors of some races of domesticated cattle. See R. Lydekker, *The Ox and its Kindred* (1912); Storer, *Wild Cattle of Great Britain* (1879); Wilson, *The Evolution of British Cattle* (1909).

Usagara, a region in Tanganyika Territory, between Lake Tanganyika and the coast.

Usbegs. See UZBEGS.

Usedom, an island of Prussia, lies at the mouth of the Oder, and together with the island of Wollin shuts off the Stettiner Haff from the Baltic. Area, 157 sq. m. On its east side is the port of Swinemünde (q.v.), on the south-west side the town of Usedom.

Uses, a form of equitable ownership peculiar to English law. Under the old law, if A and B were enfeoffed in land, to hold it to the use of C, A and B were legal owners, but C could bring them into a court of equity, and compel them to perform the

trust. Uses were employed in various ways to evade the policy of the feudal law; parliament attacked the system more than once, and at last in 1536 the Statute of Uses provided that, where one held to the use of another, the person having the benefit of the use should also have the legal estate. The effect of this enactment was just the reverse of what parliament intended; uses were freely created, in order that the statute might operate upon them, and turn them into legal estates; equitable interests were created by the simple expedient of limiting a 'use upon a use.' Trusts (q.v.) of land and modern forms of conveyancing cannot be explained without reference to the old doctrine of uses.

See the works of Williams and Challis on *Real Property*. A clear account of the system is given in Bacon's famous *Reading on the Statute of Uses*.

Ushak. See CARPETS.

Ushant (Fr. *Ouessant*), an island off the west coast of France, included in the dept. of Finistère, with an area of 20 sq. m. The coasts are escarped and difficult of access; the soil is fertile. Off Ushant an indecisive sea-fight took place on 27th July 1778 (see KEPPEL); and here too on 'the glorious first of June' 1794 Howe (q.v.) gained a great victory, capturing seven vessels, one of which, the *Vengeur*, almost immediately went down with more than half her crew—in no glorious 'suicidal sinking,' in spite of Barère (q.v.).

Ushas (Gr. *Ēōs*, Lat. *Aurora*), Hindu goddess of the Dawn. See VEDA.

Ushaw, 4 miles WNW. of Durham, the seat of St Cuthbert's Roman Catholic College, founded in 1804, in succession to the dispossessed seminary for priests at Douai (q.v.).

Usher (or USSHER), JAMES, in Dr Johnson's phrase 'the great luminary of the Irish church,' was born in Dublin, January 4, 1581. His father, Arland Usher, one of the clerks in Chancery, was a gentleman of good estate and family; his uncle, Henry Usher (*c.* 1550–1631), was his predecessor as Archbishop of Armagh. A brother of his mother's was that Richard Stanihurst who with his sister and father turned Roman Catholic, translated the first four books of the *Æneid* into English hexameters, and wrote the Description of Ireland for Holinshed's *Chronicles*. At thirteen Usher entered the newly-founded Trinity College, Dublin, being its second scholar and eighth fellow elected by merit. His father had intended him to study law, but his death in 1598 left the young scholar free to follow his natural bent. He first made over all the family property to his brother and sisters, only keeping enough for his support during his studies. The learned Catholic Thomas Stapelton's *Fortress of Faith* led him at twenty to the study of the Fathers, and their writings he read systematically every day for eighteen years. At nineteen he argued publicly with success against the Jesuit Henry Fitzsymons; in 1600 he took his Master's degree, and was chosen Catechist reader in his college; in 1601 he received both orders on the same day, and shortly after was appointed to preach at Christ Church on Sunday afternoons before the Lord Deputy. About 1603 he became Chancellor of St Patrick's, and in 1607 he was chosen professor of Divinity in Dublin, which office he held for thirteen years. He often visited England, and became an intimate friend of Camden, Selden, Bodley, Cotton, and Evelyn. In 1620 he was made Bishop of Meath, Privy-councillor for Ireland in 1623, and Archbishop of Armagh in 1625. He took part in 1634 in the convocation which drew up the canons of the Irish Church. He had Quarles as his secretary down to the outbreak of the Rebellion. Usher left Ireland for England in 1640, and it was on this journey that Wodrow tells us in his *Analecta* he paid a visit at Anwoth to Samuel Rutherford. During the Irish rebellion in that year all his property save his books was plundered. He continued to live in England, declined to sit in the Assembly of Divines at Westminster, and for about eight years was preacher at Lincoln's Inn. He was constant in his loyalty to the throne, yet was treated with more than indulgence by Cromwell. In his last years he lived with his son-in-law, Sir Timothy Tyrrell, at Cardiff, under the roof of the dowager Lady Stradling at St Donate, Glamorganshire, and of the dowager Countess of Peterborough, in whose house at Reigate in Surrey he died, 21st March 1656. Cromwell gave him a splendid burial in the Erasmus Chapel of Westminster Abbey, allowing the Church of England burial service to be used on that occasion alone.

Usher stands distinguished amongst the theologians of any age, not more by his vast learning and sagacity than by his charity, his sweetness of temper, and his humility. We are told that at the close of his long conferences with the learned Puritan Dr John Preston the good archbishop would say: 'Come, doctor, let us say something about Christ before we part'—a thoroughly characteristic story. He was Calvinistic in theology, and moderate and tolerant in his ideas of church government. As an *eirenicon* he proposed a modification of episcopacy which failed to commend itself to the zealots of either side—this was published by Dr Bernard in 1658 as *The Reduction of Episcopacy to the Form of the Synodical government in the Antient Church*. Of his numerous writings the greatest is the *Annales Veteris et Novi Testamenti* (2 vols. folio, 1650–54), which gave us the long accepted chronology of Scripture, the Creation being fixed at 4004 B.C., &c. As early as 1647 we find from the Stationers' Hall Registers that Fuller was labouring at an English translation of this work, which appeared in 1658 under Usher's own name only. Fuller acknowledges in his *Church History* that his 'wares' were from the 'storehouse of that reverend prelate—the Cape merchant of all learning.' He says further: 'Clean through this work, in point of chronology, I have with implicit faith followed his computation, setting my *watch* by his *dial*, knowing his dial to be set by the *sun*.'

Usher's *Discourse of the Religion anciently professed by the Irish and British* (1632) and *Britannicarum Ecclesiarum Antiquitates et Primordia* (1639) opened up new ground, giving in Gibbon's phrase 'all that learning can extract from the rubbish of the dark ages;' in his *SS. Polycarpi et Ignatii Epistolæ* (1644; cum appendice Ignatiana, 1647) he supported the authenticity of the Middle Form of the much contested letters of Ignatius (q.v.); the Calvinistic *Body of Divinity* (1645) was published without his consent, and part of it was denied to be his; his *De Græca Septuaginta Interpretum Versione Syntagma* (1655) was the first attempt at a real examination of the Septuagint. There is a complete edition of his writings by Professor Elrington and Dr J. H. Todd (17 vols. 1841–48–62–64); Lives by Nicholas Bernard (1656), Richard Parr (1686), Elrington, and Carr (1895). See W. Ball Wright, *The Ussher Memoirs* (Dublin, 1889); Life by Collins (1902).

Usk, a river of Brecknock and Monmouth, winds 57 miles south-east to the Bristol Channel at Newport. The town of Usk, 12 miles SW. of Monmouth, has a pop. of 1500.

Üsküb, Turkish name of Skoplje (q.v.).

Usnea, a genus of lichens, of which *U. barbata* is well known. It hangs in beard-like tufts from branches of trees. The general appearance of its fringed branches and apothecia is shown at LICHENS, fig. 1.

Ussuri. See AMUR.

Ústí. See AUSSIG.

Ustica, an island 40 miles N. of Palermo in Sicily, measuring 3 by 1½ mile, and rising to a height of 800 feet. It is very fertile, and almost the whole surface is intensively cultivated, producing wine, corn, figs, and other fruit and vegetables. The sea-fishing is good, and many birds of passage (quails, snipe, &c.) are shot there. Pop. 1000.

Ustilagineæ, Ustilago. See FUNGI, p. 42; PLANTS (*Diseases*); SMUT.

Ustiug Veliki, or SEVERODVINSK, a town of Russia on the Sukhona, 580 miles ENE. of St Petersburg, has many churches and a university (1920); pop. 11,000.

Ust Sysolsk, capital of the Zyrian territory.

Ust-Urt. See CASPIAN SEA.

Usury now means iniquitous or illegal interest, but formerly meant interest of any kind on money lent. The Mosaic law forbade a Jew to take usury from a fellow-countryman. Greek and Roman moralists mainly disapproved of any usury; the church fathers, the popes, the canon law, absolutely forbade it; hence the Jews had a kind of monopoly of usury at the Reformation. Luther condemned interest, while Calvin allowed it. The moral question is still debated, and moralists such as Ruskin have waxed fierce against the taking of interest. A long series of laws were passed on the understanding that usury was wrong, but admitting many exceptions; the usury laws, thus doing much harm and multiplying legal fictions, were finally repealed in 1839. From that time till 1900 there was practically no law on the subject, and any amount of interest could be enforced on agreement or contract. In consequence, however, of numerous cases of oppression by professional money-lenders trading under various names, and the enormous rates of interest and other charges exacted, a commission was appointed by the House of Commons in 1897–98 to inquire into the subject. The result was the passing of the Money Lenders Acts of 1900 and 1911, by which all money-lenders are compelled to register their business names and addresses, and must not trade in any other under heavy penalties. When proceedings are taken by a money-lender to recover money lent, the court may take into consideration whether the interest and other charges are excessive or oppressive, and if so, may set aside any contract and give an equitable decision, and may even order the repayment of any oppressive charges already paid. See INTEREST, PAWNBROKING.

Utah, a state of the American Union, in the Rocky Mountain region, is nearly rectangular in shape, extending from north to south about 350 miles, and from east to west 200 miles, with an area of 84,990 sq. m., including 2806 sq. m. of water. It lies in a great plateau region, having an average elevation of 5000 feet above the level of the sea. The Wahsatch Mountains, running north and south, and their eastern spur the Uintah Mountains, divide it into two widely differing portions. The division lying to the north and west of these ranges belongs to the great interior basin of the continent, from which no water escapes except by evaporation. The eastern and southern sections form a part of the basin of the Colorado River, and are noted for their lofty and broken plateaus and deep cañons. The greatest elevation is attained in the Uintah range—nearly 14,000 feet. Mounts Nebo and Baldy, the highest points of the Wahsatch range, are about 12,000 feet high. In the basin region there are some lower and parallel ranges having a general north and south trend. The prevailing westerly winds are robbed of their moisture by the lofty peaks of the Wahsatch range, and the streams which flow from the mountains find their way toward the west, ultimately discharging their waters into Great Salt Lake, or into some of the smaller saline lakes or sinks of the desert. In the valleys lying among the lateral spurs along the western side of the Wahsatch range irrigation is not difficult. On the east, however, the towering plateaus which overhang stupendous cañons have but a slight and irregular rainfall, and except in a few favoured valleys agriculture is almost an impossibility. Portions of the Colorado basin are nevertheless, especially in the rainy season, well adapted for grazing. Even in the valleys along the western base of the mountains the success of irrigation varies in different years. The streams during the spring and summer are fed by the melting of the snow on the mountain summits. If the snow chances to fall early in the winter it becomes compact, and the melting is retarded. A fall of snow late in the season lies loosely on the mountain sides, and the water reaches the valleys before the crops are ready to receive its full benefit. Much of the soil in the west is extremely fertile, but, as it lacks the necessary element of moisture on account of the insufficient altitude of the surrounding mountains, large areas of land seem destined to remain unproductive desert wastes. Great Salt Lake (q.v.), with its extraordinary percentage of saline matter in solution, is but the remnant of a vast body of fresh water which once covered western Utah. During the 20th century, however, agriculture has greatly developed; wheat, oats, and other grains are grown, and immense crops of potatoes are produced. Cattle and sheep raising and fruit-growing are important. The mineral wealth—gold, silver, lead, copper, &c.—is very great, and there is a considerable output of coal. There are a few industries in connection with the mining or with the farming. Education in Utah is at a high level, while three-quarters of the church members are Mormons, the remainder belonging to various faiths. Besides the state capital, Salt Lake City (the seat of the University of Utah), the important towns are Ogden, Provo (the seat of the Brigham Young University), and Logan. Pop. (1870) 86,786; (1890) 207,905; (1910) 373,351; (1920) 449,396.

Utah, which formed a part of the territory acquired by the United States from Mexico in 1848, had been colonised by the Mormons in 1847 under Brigham Young (q.v.), to whose administrative ability the early development of this region is in a great measure due (see MORMONS). In 1850 a territorial government was organised, and in 1868 the boundaries of the territory were definitely defined as embracing the present area of the state. Utah was admitted as a state into the Union in 1896.

See *Histories of Utah* by Bancroft (1888), and Whitney (1892-98); Jones, *Utah* (1902).

Utakamand. See OOTACAMUND.

Uterus. See WOMB.

Uther Pendragon, father of Arthur (q.v.).

Utica, an ancient city of North Africa, 20 miles NW. of Carthage, originally founded as a Phœnician colony in 1101 B.C. Its ruins include an amphitheatre, an aqueduct, and the remains of quays; for a bay then carried the sea (now nearly 10 miles distant) to the site. During the third Punic war Utica submitted to Rome, and became the capital of the province of Africa. Afterwards it was the see of a bishop, till its destruction by the Arabs. Here the younger Cato (q.v.) killed himself.

Utica, a city of New York, 232 miles by rail NNW. of New York City. Regularly and substantially built, it rises in a gentle slope from the

south bank of the Mohawk River, and is traversed by the Erie Canal. It contains some fine municipal buildings, a state lunatic asylum, and a large and handsome Masonic Home and School (begun in 1891), is a noted market for cheese, and manufactures cottons and woollens, organs and pianos, machinery, &c. Pop. (1880) 33,914; (1910) 74,419; (1920) 94,156; (1925) 101,604.

Utilitarianism, the ethical theory which finds the basis of moral distinctions in the utility of actions—i.e. their fitness to produce happiness. This hedonistic theory, its genesis, and its various types are dealt with at ETHICS. The words utility and utilitarian in this sense were first used by Bentham about 1802; Mill, however, believed that he first employed in philosophy the term utilitarian (which he found in Galt's *Annals of the Parish*) in 1823. Utilitarian and utilitarianism are also used loosely in a much wider sense of the view of life which would regulate all effort and action with total disregard to what is merely noble or beautiful, to culture, grace, and artistic perfection, and would look for the universal test of aims and conduct in practical usefulness alone. 'Will it pay?' becomes then the first and the final problem for this degrading and impossible Philistinism, which is the negation of all poetry and art, of ideal morals or true religion. This is of course not necessarily involved in the acceptance of a hedonistic system of ethics, nor should it be used—though assuredly it has been, by Ruskin and others—to bring the science of economics into disrepute because it makes utility one of its fundamental terms. Utility, according to the economist, 'has nothing to do with the philosophic or moral conception. . . . It is but the capacity to satisfy a desire or serve a purpose' (Mill), be that purpose good or evil. The term is 'morally colourless,' but not immoral or materialistic, even though economic utilities and wealth are made synonymous. The chief technical terms involving the conception of utility are *total utility* and *final* (or *marginal*) *utility*, the former referring to the sum of the utilities obtained by the consumption of all the successive portions of a commodity, the latter referring to the utility obtained from the last portion consumed. See the articles BENTHAM, JEVONS, MILL, RUSKIN, and POLITICAL ECONOMY, p. 275; Leslie Stephen, *The English Utilitarians* (1900); and Davidson, *Political Thought in England: Bentham to Mill* (1915); Jevons, *Theory of Political Economy* (1871); and other standard text-books on economics.

Utopia (Gr. *ou*, 'not,' and *topos*, 'a place,' equivalent to 'Nowhere'), the name given by Sir Thomas More (q.v.) to the imaginary island which he makes the scene of his famous political romance, *De Optimo Reipublicæ Statu, deque Nova Insula Utopia*, originally published in Latin at Louvain in 1516, and translated into English by Raphe Robynson (1551; 2d ed. 1556), as well as by Bishop Burnet in 1683. More represents this island as having been discovered by Raphael Hythloday, a companion of Amerigo Vespucci, but it of course is England, its capital Amaurote, London. Its laws and institutions are represented as described in one afternoon's talk at Antwerp, occupying the whole of the second book, to which, indeed, the first serves but as a framework. More's romance, or rather satire, obtained a wide popularity, and supplied (though incorrectly enough) the epithet *Utopian* to all impracticable schemes for the improvement of society. See Mumford, *Story of Utopias* (1923); and Hertzler, *History of Utopian Thought* (1923).

Utraquists. See HUSS.

Utrecht (*Oude trecht*, 'old ford'; Lat. *Trajectum ad Rhenum*), the capital of a province of the Netherlands, on the 'Old' Rhine (q.v.), 23 miles SSE. of Amsterdam and 38 ENE. of Rotterdam. The walls were levelled in 1830, and formed into shady promenades, the present fortifications consisting of strong forts. St Martin's Cathedral, founded by St Willibrord about 720, and rebuilt in 1254–67, had its nave destroyed by a hurricane in 1674, so that the choir and the tower (338 feet high, with a marvellous view) now stand separate. The famous university, founded in 1634 and enlarged in 1894, has a good library. The veterinary school also ranks as a university. Other edifices are the 16th-century Roman Catholic cathedral, the mint, the courts of justice, the town-hall (1830), the archiepiscopal and central museums with some fine lace, missals, &c., and some pictures, the antiquarian museum, the 'Pope's house' (built by Adrian VI., who was born here in 1459), the palace (in 1807) of Louis Bonaparte, &c. The town since 1723 has been the headquarters of the Jansenists (see JANSEN), and there are now two archbishoprics—orthodox Roman Catholic and Jansenist or Old Catholic—established at Utrecht. It is the centre of the Dutch railway system and of a rich agricultural district. The manufactures include tobacco and cigars, woollen fabrics and carpets, salt, furniture, chemicals, machinery, &c. Pop. of the town (1869) 59,299; (1901) 166,800; (1920) 140,309; and of the province (1920) 342,322, its area being 525 sq. m. Utrecht is one of the oldest cities of the Netherlands, and probably was founded by the Romans. In the Middle Ages the bishop of Utrecht wielded great power. Here the famed union of the northern provinces for the defence of political and religious freedom was formed, 23d January 1579, when William of Orange was elected Stadhouder; and Utrecht is famous for the nine distinct treaties there concluded on 11th April 1713, which brought to a close the war of the Spanish succession (see SUCCESSION WARS). By the treaty between France and Britain, the former ceded St Kitts, Hudson Bay, Nova Scotia, and Newfoundland (fishing rights being reserved), recognised the Hanoverian succession, engaged that the crowns of France and Spain should never be united, and that no part of the Spanish Netherlands should be ceded to France; whilst Spain ceded her Italian possessions to Austria, and gave up Gibraltar and Minorca to Britain.

Utrecht, capital of the division of Utrecht—formerly the southernmost province of the Transvaal, which was transferred to Natal in 1903—is 30 miles NE. of Newcastle; pop. 1800.

Utrera, an old town of Spain, 19 miles by rail SE. of Seville; pop. (1920) 21,316.

Utricularia. See BLADDERWORT, INSECTIVOROUS PLANTS.

Utsonomiya, a town of Japan, 72 miles by rail N. of Tokyo; it is a busy commercial centre. Pop. (1925) 76,138.

Uttoxeter, a market-town of Staffordshire, on an eminence above the Dove, 14 miles ENE. of Stafford. It has a modern church with an ancient tower and lofty spire, a town-hall (1855), a mechanics' institute, a free grammar-school (rebuilt 1859), and manufactures of iron, nails, ropes, beer, &c. Pop. 5000.

Uvula. See PALATE, DIGESTION.

Uxbridge, a market-town of Middlesex, on the Colne, 16 miles W. of London. St Margaret's Church was restored in 1872; St Andrew's (1865) has a spire of 170 feet; there are also a town-hall (1836), and a spacious corn exchange (1861). Pop. (1851) 3236; (1921) 12,923. Commissioners met here in January 1645 to discuss terms of peace between

Charles I. and the parliament, but separated the month after without coming to any agreement. See Redford's *History of Uxbridge* (1818).

Uxmal, a ruined city in the north-west of Yucatán, 40 miles SW. of Mérida, with vast remains of ancient grandeur, temple-terraces (see TEOCALLI) like those at Palenque (q.v.), &c.

Uzbegs, an important branch of the Turkish family of Tatars, who still constitute the chief element in the native population in Khiva, Bokhara, Khokand, and some other parts of Turkestan. In some places their blood is mixed with a Tajik strain; elsewhere, with Kipchak, Kalmuck, and Kirghiz elements. Some are still nomads, but the greater bodies are settled in towns. The word 'Uzbegs' seems to originate with Uzbeg (Chinese Yüe-tsi-pieh) Khan, of the Golden Horde (1312–42), established by Batu Khan near the Lower Volga a century earlier (1242), under the name of *Desht* (i.e. Steppe) Kipchak. Uzbeg's successors, Mamai and Tokhtamish, had several fights with the rebellious Dukes of Moscow; but the great conqueror Tamerlane (q.v.) so devastated Tokhtamish's dominions in 1395 that Russian tribute submission to the Kipchaks became nominal; and the rival Khans of Kazan and the Crimea further weakened the Uzbeg power in Russia, which was finally destroyed in 1502 by the Khan of the Crimea. Chinese history does not mention the Uzbeg dynasty of Khiva (17th century), which country for a thousand years had been known to them as Urgendj and Kharism; but Pa-tu (son of Genghis's eldest son Djuchi) is often spoken of by name: the word Uzbeg never occurs, for China had lost touch with Russia long before 1312, and the Ming dynasty (1363–1644) had scarcely any serious relations with Turkestan, though after Tamerlane's death in 1405, during his abortive attempt on China, Samarkand is recorded as having sent 'tribute' every few years for about two centuries. (See TAMERLANE, TURKESTAN).

Uzbekistan. See TURKESTAN.

Užhorod (Mag. *Ungvár*), capital of Carpathian Ruthenia, on the Ung, on the western border of the province, has a Uniat Ruthenian bishop, a fine church, pottery works, and 20,000 inhabitants.

V

is the twenty-second letter of our alphabet. Until modern times U and V were not two letters, but mere graphical varieties of the twentieth Roman letter, which was used both as a vowel and as a consonant. The origin of the letter, and the history of its use as a vowel, have been treated in the article on U. The present article is concerned with the history of its consonantal function, which now belongs only to the v form.

The original Latin sound of v, when used as a consonant, was nearly that of the English *w*; but in late Latin this sound changed into the voiced bilabial spirant, i.e. a consonant differing from *b* in that the lips are not completely closed, so that the escape of breath is not checked. Later still, this consonant became dentilabial, i.e. pronounced with the lower lip touching the upper teeth. In the languages descended from Latin, with the exception of Spanish, the letter has the dentilabial sound (=English *v*, differing from *f* in being voiced). The Spanish *v* is bilabial, *b* and *v* being in ordinary pronunciation sounded alike.

In some Old English MSS. v and u occur with the Roman value of *w*. (With regard to the use of uu for the sound, see the article W.) In general, however, v or u was little used as a consonant in English until after the Norman Conquest. When in the 12th century the language came to be spelt phonetically according to French rules v and u were employed to denote the sound *v*, which in earlier English did not occur initially, and in other positions was expressed by f. Scottish scribes of the 15th and 16th centuries often used *v* for *w*, and *vice versâ*; and this inversion is found in some early Scottish printed books.

In all the Germanic languages except High German v has (exactly or nearly) the same sound as in English. In Old High German v was written for the sound of *f* under certain conditions. This notation was probably adopted from the orthography of some Low German dialect in which, as in Dutch, the sound of *f* had become voiced. In modern German v has regularly the sound of *f*. The present German spelling retains the v in a considerable number of words, while in others it substitutes f, without any reason either phonetic or etymological to account for the difference.

So long as u and v were regarded as one letter, the general European name *ū* (variously pronounced in the different languages) was applied to both forms. When v became a separate letter, it became necessary to provide a name for it. The German name *vau* was adopted from Hebrew in the 16th century. In the other languages the name is *vē*, formed on the analogy of the names of B, C, D, &c.

Vaal, a river of South Africa, rises in the south-east of the Transvaal (q.v.), and flows W. and SW. generally along the northern border of the Orange Free State to its junction, after a course of some five hundred miles, with the Nu Gariep or Orange River. At Vereeniging a barrage has been formed to supply water to the Rand gold-mines. Other irrigation schemes have been proposed.

Vaalpens, a mysterious race of coal-black pygmies (about 4 feet high) said to live in caves and holes in northern Transvaal, in savagery below even the Bushman level.

Vaasa (Swedish, *Vasa* or *Wasa*), a town in Finland on the shore of the Gulf of Bothnia, founded 1606. Vaasa is a commercial town of great importance, carrying on business particularly with the towns situated in Sweden on the opposite coast of the Gulf of Bothnia. It contains many industrial establishments. Pop. (1920) 23,957; half Finnish-speaking, half Swedish-speaking.

Vaccination (inoculation with *vaccine*, the virus of cowpox, as distinguished from protective inoculation with actual Smallpox, q.v.) is the production of cowpox (*vaccinia*) in the human system with the object of protecting against smallpox (*variola*). The practice was introduced in 1796–98 by Jenner (q.v.), who was led to investigate the subject by the belief current in Gloucestershire that an individual who contracted cowpox by milking an infected animal, while suffering from abrasions on the fingers, was insusceptible to smallpox. By observation and experiment Jenner confirmed the popular view, and his ideas gradually made headway, in spite of opposition both from the medical profession and the public. Thus for the past century vaccination has been a recognised means of preventing smallpox all over the world, so that, in civilised countries at any rate, the inhabitants and even the medical profession have little knowledge of how serious a disease smallpox is. *Natural* cowpox is a disease of the teats or udders of cows, on which small blister-like appearances occur, called vesicles. The fluid or *lymph* that these contain, when inoculated into a scratch on the skin (in modern usage into four areas on the upper arm), has the property of causing similar vesicles, and thus transmitting the disease. Jenner thought that cowpox was derived from an ailment of horses' heels called Grease (see WEED). This is quite likely true, but is a subsidiary point. The important question is whether cowpox in cattle is identical with smallpox in man. Ceely and Babcock, Simpson, Hime, and others have 'variolated' cows—i.e. have produced a disease by injecting them with lymph from smallpox vesicles. After the first injection there must, however, be a transmission from one animal to another through several removes before a vesicular condition identical with cowpox is produced. When this has been attained the lymph from the vesicles protects calves against inoculation with cowpox, and when used for inoculation in man it originates a typical non-infectious condition identical with the results of vaccination. There is thus strong reason for the belief that cowpox and smallpox are the same disease. In the cow the disease takes a mild course, and the virus appears to be of constant strength. Other examples of such differences in the virulence of a disease in different animals are well known.

For many years after the Jennerian system of vaccination was instituted an *artificial* cowpox

was maintained in man by what was called arm-to-arm inoculation—the *humanised* lymph from a well-formed vesicle being used to infect a fresh individual. Ordinarily lymph was taken from a vaccinated arm at the end of a week, the best vesicles in the healthiest children being the source. The method gave, on the whole, satisfactory results. It had, however, its disadvantages. It was alleged that, inherent in the procedure, there was the risk of erysipelas, abscesses, blood-poisoning, and other diseases being conveyed by the agency of the lymph. Such accidents did occasionally occur, though these were probably as often due to infected instruments being used for the scarification as to faults in the lymph. It is to be borne in mind that vaccination was introduced seventy years before the development of Listerian methods in surgery had emphasised the necessity for the sterilisation of instruments used in even the simplest operations. Another disadvantage of the use of humanised lymph was the fact that, except in urban vaccination stations, it was difficult at all times to have available a succession of suitable vesicles as a source of lymph. From about 1880, therefore, the use of humanised lymph has gradually been given up, and *calf lymph* substituted. This is obtained by shaving the abdomen of a calf and inoculating the skin in fifty or sixty places; the ordinary vesiculation appears, and on the fifth day the lymph is drawn off and placed in the small capillary tubes which are familiar. One calf will yield enough lymph for vaccinating 400 to 500 children, and it is obvious that not only can the product be always obtained when the vesicles are at their best, but the supply is only limited by the number of calves it is practicable to employ. When calf lymph was first introduced the animals were inoculated from spontaneous outbreaks of cowpox, but it is probable that some of the strains at present in use, especially in Germany, came originally from the 'variolation' of calves (see above). For many years continuous successive inoculation of one batch of calves from the previous batch has been the means by which a strain of lymph has been maintained. The proportion of successful vaccinations in children when calf lymph is used is the same as with human lymph. The number of 'bad arms' resulting is very small; and although subsequent skin infections have been attributed to its use, it is only in the case of pemphigus that there is evidence of a serious infection being specifically attributable to the calf as the animal used in the production of the lymph. A great improvement in the quality of calf lymph followed on Copeman's work, whereby it was shown that if the lymph is treated with glycerine there is a reduction, almost to the vanishing point of the bacteria—coming chiefly from the calf's skin—which it almost inevitably contains. It is such *glycerinated calf lymph* which is now chiefly in use. It is prepared by taking the crude lymph from the calf and grinding it up with glycerine so as thoroughly to mix the two ingredients before the product is tubed. In addition to its purity, the keeping qualities of glycerinated lymph are superior to those of the calf lymph originally used. Lymph is made in large quantities in the laboratories of the Ministry of Health in this country, and also in a number of private commercial establishments. The production of lymph which contains the virus of cowpox in an almost uncontaminated state, and the recognition of the necessity of sterilising the instruments used in the scarification, reduce the risk of vaccination to the possibility of the skin of the vaccinated individual having upon it harmful organisms which may infect the scratches. This cannot be wholly excluded, as the application of powerful antiseptics might kill the virus which is to be introduced. The removal of the superficial epithelium of the skin by thorough washing with soap and water, and especially by very vigorously rubbing the part with a rough towel, will do much to purify the site of inoculation.

Legislation regarding Vaccination.—The first obligatory vaccination law in England was enacted in 1853. In 1867 Boards of Guardians were permitted to appoint special vaccination officers, and were obliged to do so by the act of 1871. In 1898 a new law was passed extending the age of infant vaccination from three to six months. and substituting the offer of free vaccination at home for vaccination at central stations. At the same time the right of a public vaccinator to take lymph from a child's arm was done away with, and the substitution of calf for humanised lymph was thus encouraged. The act contained a permissive clause, under which, if the parents believed that a deleterious effect on a child's health would result, the offer of vaccination could be refused. In Scotland the law is practically identical with that of England.

In other countries the state of the law varies. In Germany revaccination has been compulsory since 1874, while in France vaccination is voluntary. In the United States the laws are different in different states.

The Efficacy of Vaccination.—In dealing with this aspect of the question we must first of all realise what in essence vaccination is. The fundamental fact is that one attack of smallpox renders the subject insusceptible to the disease for life. If cowpox is in reality smallpox in a mild form, then vaccination consists in giving the individual a slight attack of smallpox, and thus its effects would have a rational basis. Though we have adduced reasons for believing that the two diseases are identical, the evidence is indirect. The identity could only be absolutely established by both being proved to be due to the same cause. Now in neither case is the cause known, but in both it belongs to the group of filterable viruses (cf. Hydrophobia, q.v.), i.e. if the lymph is filtered through unglazed earthenware it is still infective. The indefiniteness of the situation regarding the relations of the two diseases, and the fact that nearly a century was to elapse before the question of the development of immunity against disease could be scientifically investigated, are responsible for much of the controversy which has centred round vaccination. The most important point which criticism has established is that vaccination, unlike a natural attack of smallpox, does not confer a lifelong insusceptibility. The effect of inoculation in infancy diminishes after the seventh year of life, and the procedure ought to be repeated before the tenth year. If, however, this be done, and again repeated every ten or fifteen years, insusceptibility is continuously reinforced, and the individual can thus have an effectual protection against smallpox infection during the whole of life—a protection as efficacious as that conferred by an attack of smallpox early in life. When the recognition of this fact has been acted on, smallpox has been virtually stamped out. The most striking experience in this respect is found in a study of the facts relating to the similar populations of Germany and Austria, in which the incidence of smallpox exhibited a close parallelism. In 1874 revaccination was made compulsory in Germany. In the succeeding years, while the German death-rate fell to a negligible quantity, ranging from 0·3 to 3·6 per 100,000 living, in Austria, on the other hand, it remained as before, the range being from 39 to 82 per 100,000 living. Immunity towards smallpox conferred by vaccination also finds support in the facts relating to nurses concerned in the treatment of smallpox patients. The disease has for long been so rare that when an outbreak occurs

the nurses of fever hospitals have ordinarily not been previously exposed to infection, which, even in a mild form, might confer immunity. Thus they are usually revaccinated, with the result that the disease practically never occurs in the staff of a smallpox hospital. If, as has sometimes happened, the revaccination of an individual not vaccinated since infancy is accidentally overlooked, that individual has frequently contracted the disease.

As we have said, we have in modern times great difficulty in realising the ravages of smallpox before inoculation was practised and before vaccination was introduced. In London, between 1660 and 1679, the average annual deaths from the disease numbered 4170 per million living; for the period 1801–10 the figures were 2040 per million; in 1831–35 (by which time vaccination was beginning to be prevalent) the annual death-rate had fallen to 830 per million. Such figures may be taken as fairly representing the data on which the earlier conclusions relating to the efficacy of vaccination were founded. The evidence derived from considering the effects of revaccination constitutes, however, an incontrovertible argument for holding that Jenner's discovery furnishes a means of combating one of the most serious diseases to which the human race is liable. The advisability of its extended and continued application is not lessened by there being reason for thinking that the virulence of smallpox has been diminishing somewhat during the last half-century. Even if this is merely a phase in the waning and waxing of virulence which are common features of most epidemic diseases, the widespread occurrence of mild smallpox would cause such a dislocation of the ordinary life of a community as to make its avoidance highly desirable.

The Present Situation in Britain.—A liberal interpretation of the unfortunate permissive clause relating to infant vaccination in the act of 1898, along with the absence of legislation providing even for the offer of free vaccination in later life, has resulted in a very considerable proportion of the population (in Scotland 41 per cent.) being completely or inadequately protected against smallpox. Failure to take advantage of the offer of free vaccination in infancy may be due to a variety of causes. The natural disinclination of parents to inflict suffering on their children is sufficient often to blind them to the greater suffering and to the danger to which, later, these children may be exposed. In less conscientious persons indolence may play a part, but most of all, probably, neglect of the advantages offered is traceable to the persistence of unreasoning prejudice, the product of the traditional antipathy with which ignorance contemplates developing knowledge. The effects of these factors are that from time to time outbreaks of smallpox of varying extent and intensity occur, and these are likely to continue to occur, especially when cases of the disease are introduced from abroad. The histories of such outbreaks are similar. A small group of cases of smallpox occur which, if they include vaccinated persons whose protection is passing off, may be at first unrecognised or mistaken for chickenpox; the disease is diagnosed, and the public health authorities apply vigorous isolation measures to the affected persons and those in contact with them, but, before the arrangements become effective, opportunities for infection have occurred; in many of the cases the source of infection is not traceable. Unvaccinated children are especially attacked, with a high death-rate. The community is put to much inconvenience, and great expense is often incurred for emergency hospital accommodation—useless when its object has been attained. A revaccination service is organised, and is largely taken advantage of, and partly due to this, partly following on the ordinary law of the gradual dying away of any epidemic disease, the outbreak terminates.

See Copeman, *Vaccination, its History and Pathology* (1899); *Vaccination and Smallpox*, by E. J. Edwardes (1892), is a plea for compulsory revaccination. Expressly in defence of vaccination are Ernest Hart, *The Truth about Vaccination* (1880); J. C. M'Vail, *Vaccination Vindicated* (1888); *Half a Century of Smallpox and Vaccination* (1920). Directly hostile are A. R. Wallace, *Vaccination Proved Useless and Dangerous* (1889); C. Creighton, *Jenner and Vaccination* (1888), and E. M. Crookshank, *History and Pathology of Vaccination* (1890); and the publications of the London Society for the Abolition of Compulsory Vaccination (founded 1887). See also GERM, INOCULATION, HYDROPHOBIA, JENNER, SMALLPOX.

Vacciniaceæ, a family akin to Ericaceæ, of which some make it a division. It includes the cranberry and whortleberry.

Vacuum literally means space empty of matter—i.e. empty of those ordinarily recognised realities whose properties are the objects of our perception. To empty a region once filled with matter is a practical impossibility. The Air-pump (q.v.) enables us to remove from the interior of a vessel a large fraction of the air originally contained therein. By other devices we may to a still greater degree reduce the quantity of gaseous matter filling the region; but even with the most efficient means we find it impossible to get rid of a last residuum. Thus the ideal vacuum is unattainable. The word, however, is used as applicable to the approximate realisation of this absolute emptiness, and the smaller the residuum left the higher is the vacuum said to be. Across such vacua light passes, and magnetic and electrostatic inductions take place with even greater ease than if the region were filled with air at ordinary pressure. Hence we conclude that a vacuum is after all a plenum, not of matter, in the ordinary acceptance of the term, but of some substance capable of transmitting energy. This substance we call the Ether (q.v.).

Besides the ordinary air-pump, there are several forms of apparatus useful for producing vacua. The most efficient of these are the various modifications of the Sprengel pump. In its simplest form the Sprengel pump consists of a long vertical glass tube of narrow bore, down which mercury is allowed to flow. The region to be exhausted is connected by an oblique tube with the vertical tube, at a point some 30 inches (the barometric height) above the lower end of the latter. As the mercury streams down the vertical tube the pressure at the place where the oblique tube enters tends to be less than the atmospheric pressure by an amount equal to the pressure of the mercury column from this place downwards. The air is therefore pressed out of the side tube and connected vessel into the vertical tube, and passes down with the mercury stream and escapes at the lower end. This process goes on until nearly all the air in the connected vessel has been carried away. It is convenient to measure the pressure of high vacua in millionths of atmospheres. With the most improved form of air-pump with valves and cylinders the highest vacuum attainable is 150 times the millionth of an atmosphere, whereas with an improved Sprengel pump it is possible to get a vacuum whose pressure is only 0·005 of the millionth of an atmosphere.

Vacuum Tubes. (*a*) Geissler tubes, of glass, containing mere traces of highly rarefied gases, hermetically sealed and fitted with a platinum wire at each end traversing the glass, and capable of being connected with the secondary wires of an induction coil. When the gas in the tube is suitably rarefied, and we try to pass the secondary current through the rarefied gas, the gas begins to

glow with a colour characteristic of the particular gas. The light is rich in ultra-violet rays, and can therefore excite fluorescence in fluorescent substances; the striæ can be altered in number and position by altering the resistance or the self-induction in the circuit. (*b*) Crookes tubes, in which the platinum wires are terminated interiorly by variously-shaped metallic electrodes (negative='cathode,' positive='anode'); intended for use with unidirectional currents, continuous or intermittent. When such a current passes we may have (1) a thin layer of glow on the face of the cathode; (2) a thin dark layer ('Crookes's layer'); (3) a thin luminous region ('the negative glow'); (4) a dark region ('Faraday's dark space'); and (5) a luminous region ('positive column') filling the rest of the tube up to the anode. With relatively low vacua the positive column occupies most of the tube, and is mostly striated; as the vacuum becomes more complete, and the electric pressure applied is correspondingly raised, the Crookes dark space lengthens, at the expense of the positive column. As the vacuum is still further increased, the positive column vanishes. The tube is then nearly dark, but is filled with a radiation proceeding from the cathode. This radiation is revealed by a phosphorescent patch in the glass opposite to the cathode; and it always travels at right angles to the cathode, so that, by shaping the cathode aright, we can make the radiation produce, in the fluorescent patch, shadows of objects introduced into the tube, or may concentrate the radiations upon these. Bodies on which these radiations strike, within the tube, may give out light (diamond a very bright green, ruby or alumina a bright red, glass a green), or may even be fused; and the radiations may produce a mechanical effect by their impact or a radiometer effect (see RADIOMETER). The question as to whether this cathode-radiation consists of the propagation of ethereal disturbance or the transport of material particles has now been settled, in accordance with Crookes's view, in favour of the latter. These material particles are, however, not molecules nor even atoms; they are negatively charged corpuscles ('electrons'), each of which has about $\frac{1}{1700}$ the mass of an atom of hydrogen, and which travel in straight lines (unless deflected from their course by magnetic or electrostatic forces) with a velocity of about 18,500 miles per second. The phenomena of dark spaces and striæ in the tube can be explained as incidents of the impact of these corpuscles, proceeding from the cathode upon the residual gas in the tube, together with the ionisation occasioned by them; and if the molecules of the gas be too few for any of them to be encountered within the tube, the tube is apparently dark, or nearly so. These corpuscles, moving at high velocities, can force their way through a thin layer of aluminium fitted in the place of the phosphorescent patch and then manifest themselves as 'Lenard's rays' outside the tube. Again, the impact of these corpuscles upon a solid obstacle gives rise, upon their abrupt stoppage, to rhythmical waves in the ether (with frequencies of the order of 30000,000000,000000 per second), which are propagated as 'Röntgen rays.' The form of vacuum tube in which the cathode rays are concentrated upon a platinum plate of small size, so that the resultant Röntgen rays seem to diverge from a small source, is called a 'focus tube.' Consult Sir J. J. Thomson's *Conduction of Electricity through Gases* (1906).

Vaduz, capital of Liechtenstein, near the Rhine, 21 miles SSE. of Sankt Gallen, has a castle. Pop. 1400.

Vagrants, a very numerous class of homeless persons roaming about the country, and from town to town, subsisting chiefly upon what they can beg or steal. Their nomadic life seems to possess a charm for them which proves irresistible, and they very rarely settle down to a regular occupation after they have been any length of time wandering. Vagrants have been known as a class for many centuries; and in almost every part of the world evidence has been obtained of the existence from remote times of wandering beggars whose mode of life bears striking resemblance to that of the vagrant of the present day. The Gypsies (q.v.), while having many of the same characteristics, do not usually associate with the ordinary vagrants, but belong to a class quite distinct and exclusive.

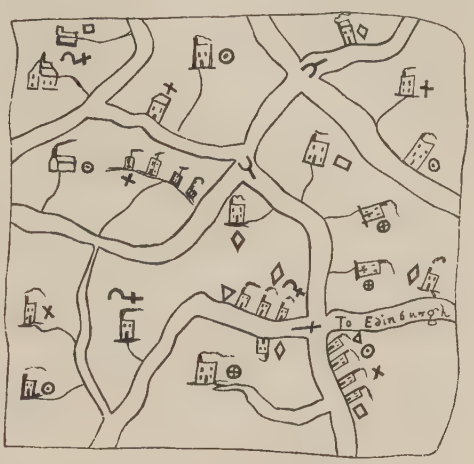
One of the most interesting and instructive records to be found concerning vagrancy is the *Liber Vagatorum, The Book of Vagabonds and Beggars*, edited by Martin Luther, and published in 1529 (Eng. trans. 1860). In it he gives a minute description of the various kinds of vagrants who were then known in the north of Europe, which may be condensed as follows:

(1) Beggars, or those who plainly and simply went about asking alms. (2) Bread-gatherers, who went about with their wives and children with them, dressed in ragged garments, collecting food, &c. These carried cooking utensils, &c. as a part of their equipment, and neither they nor their children ever left off begging from their infancy to the day of their death. (3) Liberated prisoners, who excused themselves for begging by saying they had been unjustly deprived of their liberty and character, and thus prevented from earning a different livelihood. (4) Cripples, many of whom shammed lameness or deformity. (5) Church mendicants, producing false credentials to show that they were collecting alms for religious purposes. (6) Learned beggars, young scholars or students, who said they had naught on earth but the alms wherewith people helped them, and which they would use in furthering their studies for the church or some of the professions. (7) Pretended murderers, who asserted that they had taken a man's life away, and had afterwards been seized by remorse, though it was in self-defence, and that this had driven them to a wandering life. (8) Wives of the above. (9) Lepers, or those suffering from loathsome diseases. (10) Spurious beggars, who pretended that like the Capuchin friars they were voluntarily poor. (11) Pretended noblemen and knights, who travelled about well dressed, saying that they had suffered by war, fire, or captivity, or had been driven away and lost all they had. (12) Pretended merchants, who produced documents to show that they had been possessed of merchandise which they had lost. (13) Baptised Jewesses who had turned Christians. (14) Pretended pilgrims. (15) Beggars suffering with sores. (16) Strollers professing to country-people that they were possessed of magic power, and could prevent murrain, &c. (17) Knaves with falling sickness, who took fits and assumed sudden illness. (18) Invalids alleging that they had suffered for years with incurable ailments, or whose wives or families were alleged to be so afflicted. (19) False begging priests. (20) Blind beggars. (21) Naked beggars, whose apparel was so very scanty as to arouse universal pity. (22) Silly or half-witted beggars, who, while apparently bereft of some of their mental faculties, were generally 'more knave than fool.' (23) Hangmen, who had given over their hateful avocation. (24) Women so clothed as to lead to the belief that they were pregnant. (25) Mendicants who besmeared themselves with a yellow fluid to simulate jaundice. (26) Vagrants professing to be doing penance. (27) Blind harpers. (28) Goose-

shearers, or those who put on good clothes and begged, saying that they had lain ill a long time, and were mechanics who had expended all their goods, and were ashamed to beg, but asked that they might be helped to proceed on their journey.

If one makes allowance for the changes which have taken place in the manners and customs of the people and in their modes of living, the similarity which exists between the modern vagrant and many of those described by Luther is apparent. Perhaps the most crafty of the vagrant class of the present time are to be found among the begging-letter impostors whose carefully worded epistles so often succeed in extracting contributions from the charitable. The cause assigned for these appeals is generally the death of a wife, husband, or child, or the distress which has been caused by accident or illness. The begging-letter writer generally carries on the business in such a manner as to make sure that, by the time the local police have been communicated with, the gains have been secured, and a new field of operations has been found in a distant part of the country. A considerable number of 'Indian natives' are to be found in Great Britain and over the continent of Europe who may be classed as vagrants. They go from place to place, dressed in their native costume, and subsist on the profits of small articles which they sell at street corners, and by exhibiting a printed card hung round the neck. The dress they wear, their dusky skins, and their want of knowledge of the language of the country in which they are found, form sufficient capital to enable them to live in comparative comfort, and in numerous cases even to set aside enough for their wants in old age. Representatives of this class are constantly to be found in all the large cities in the United Kingdom. Many other kinds of vagrants might be described, the most numerous amongst those not included in Luther's list being the 'Patterers' or street singers, or speech-makers, to be found in almost every country. Luther's list, however, embraces most of the vagrants of the present day. There are still the same freemasonry, slang, nicknames, and practices which formed so striking characteristics of the vagrants in the olden time. The introduction of mechanical labour, the facilities of communication between places at a distance, and the operations of the poor-laws have, however, brought about great changes among the wanderers, and the ranks of the vagrants have been swelled by a vast number of unsteady and unskilful workmen and labourers who are continually travelling from town to town 'in search of work.' Many of these degenerate from the 'tramp' into the habitual vagrant, whose habits they become daily familiar with. The habitual vagrant is known to the tramp as a 'moucher,' while the tramp is known as a 'traveller.' The 'common lodging-houses' to be found in all large cities are the meeting places where the 'traveller' and the 'moucher' foregather, and exchange experiences. These lodging-houses are known to their frequenters as 'doss-kens,' and those of them resorted to by juveniles as 'padding-kens.' In the common kitchen the vagrants discuss with business-like deliberation at night their 'work' for next day, considerately choosing 'walks' so as to interfere as little as possible with each other's 'business.' In many lodging-houses will be found rough maps or charts showing the various roads, the houses on the way, and the chances of success which each provides. If no map or chart is to be found, there is generally no lack of means of information in the persons of old members of the fraternity, who in accordance with their traditions are bound to furnish their brethren with all the assistance they can in the pursuit of their calling.

Great improvements have been made of recent years in the construction of these lodging-houses, especially regarding the sleeping accommodation, and many of the most objectionable features of the old 'doss-ken' or 'padding-ken' have been



Specimen of a Moucher's Map:

- Go in this direction; the other road not good.
- Spoiled; too many vagrants call.
- Dangerous; likely to be given in charge.
- Too poor; give nothing.
- Good; safe for something if you don't talk much.
- Religious but kind.
- Stop. If you are selling what they happen to want, they'll buy; they are cute.
- Mind the dog; may give you in charge.
- Cross sticks put by Gypsies and tramps at the junction of roads to show in which direction their friends have gone before them; the long limb pointing the way.

removed. More regard is paid to decency, and an ingenious economising of space provides each with a private apartment for sleeping.

The principal statute for the suppression of vagrancy in England is the Vagrancy Act of 1824, amended in 1873, but it has not served to check the growth in numbers of the vagrant class, while the existing arrangements under the poor-laws have often given material support to vagrancy. The 'casual wards' have been largely used by the 'mouchers,' who, bed and breakfast being provided, have thus been relieved of their most pressing daily anxieties. The shelter and society which the casual ward provided were found to act powerfully in attracting the vagrant class, and methods had to be devised for counteracting this temptation.

See John Awdelay, *The Fraternitye of Vacabondes* (1565; ed. by Furnivall, 1869 and 1880); Thomas Harman, *Caueat for Cursetors* (1568); H. Mayhew, *London Labour and the London Poor* (1851–61); Avé-Lallemant, *Das Deutsche Gaunertum* (1858–62); Ribton Turner, *History of Vagrants and Vagrancy* (1887); Paulian, *The Beggars of Paris* (trans. 1897); Jusserand, *English Wayfaring Life in the Middle Ages* (1888); Wyckoff, *The Workers* (New York, 1898); Josiah Flynt, *Tramping with Tramps* (New York, 1899); Julie Sutter, *Britain's Next Campaign*, and *A Colony of Mercy* (1903–4); Dawson, *Vagrancy Problem* (1910); W. H. Davies, *Autobiography of a Super-Tramp* (1920), and *Adventures of Johnny Walker, Tramp* (1926); for tramps' signs, André Langie, *Cryptography* (trans. 1922); the Report of the inter-departmental committee appointed (1904) by the President of the Board of Trade (1906); and the articles CHARITIES, MENDICANCY, SLANG, SHELTA, POOR-LAW, and HAWKERS.

Vaigatch. See NOVAYA ZEMLYA.

Vaishnavas, the sects worshipping Vishnu (q.v.). See also INDIA, p. 106; SANSKRIT, p. 90.

Valais (Ger. *Wallis*), a frontier canton of Switzerland (q.v.), bounded on the N. by the cantons of Vaud and Bern, and on the S. by Italy. Area, 2027 sq. m.; pop. (1920) 128,246. It forms one long and deep valley, included between two of the loftiest mountain-chains of Europe—the Pennine and the Bernese Alps—and is drained by the Upper Rhone, which, rising at its north-eastern extremity, falls at the western boundary of the canton into the Lake of Geneva. The greater part of the surface consists of barren mountain-slopes—in their higher elevations covered with the greatest of the Swiss glaciers. The forests and pasture-lands supply the inhabitants with their chief occupations. The heat at the bottom of the valley, where there is a strip of corn-land, is intense in summer, and Indian corn and the vine are grown with great success. The Grimsel and Gemmi passes connect the eastern part of the valley with German Switzerland; and the Great St Bernard and Simplon (q.v.) passes connect it with Italy. The canton is Roman Catholic, and is partly French and partly German-speaking. Sion (q.v.) and Martigny (q.v.) are the chief towns.

Valckenaer, LODEWYK KASPAR, an eminent Dutch philologist, born at Leeuwarden, 7th June 1715, studied at Franeker and Leyden, and in 1741 became professor of Greek at Franeker, in 1766 successor to Hemsterhuis at Leyden, where he died, 14th March 1785. His works included editions of the Greek grammarian Ammonius (1739), the *Phœnissæ* (1755) and *Hippolytus* of Euripides (1768), the so-called *Epistles of Phalaris* (1777), Theocritus, Bion, and Moschus (1779–81), and posthumously the *Fragmenta* of Callimachus (1799).

Valdenses. See WALDENSES.

Valdepeñas, a town of Spain, in the province of Ciudad Real, 140 miles by rail S. by E. of Madrid. The district is celebrated for its red wine. Pop. (1920) 25,218.

Valdés. See PALACIO VALDÉS.

Val de Travers, a valley in the Swiss canton of Neuchâtel. Near the villages of Travers and Couvet, both on the line of rail from Neuchâtel to Pontarlier, are great asphalt-mines (see ASPHALT), the stratum being over 18 feet thick.

Valdez, or VALDES, JUAN DE, Spanish reformer (1500–44), became an object of suspicion to the Inquisition by a politico-religious tractate or 'Dialogue between Mercury and Charon,' and settled in Italy, living the rest of his life at Naples. He was the centre of an influential circle of religious thinkers, including Ochino; though regarded as a heretic, he sought the regeneration of the Catholic Church from within, and never inclined to Lutheranism.

Among his works are *Spiritual Milk, The Christian Alphabet, CX. Considerations and Commentaries on Matthew, Romans, and 1st Corinthians*, some extant in the original Spanish, some only in Italian translations. The four last-mentioned works have been translated into English (1865–83). See monographs by Stern (Strasb. 1869) and Carrasco (Geneva, 1880), M'Crie's *Reformation in Italy*, and Wiffen's life prefixed to his translation of the *Considerations* (1865).

Valdivia, capital of one of the southern provinces (area, 8315 sq. m.; pop. in 1920, 175,141) of Chile on the navigable Callecalle, 15 miles above its mouth in Valdivia Bay. The town was founded by Pedro de Valdivia, about 1552. Its port is Corral. The climate is humid with about 180 wet days in the year. Since 1850 it has received numerous German immigrants, who have greatly developed it. Valdivia possesses the largest brewery in Chile, and is an important agricultural centre. Pop. (1920) 26,854.

Valdivia, PEDRO DE (*c.* 1510–59), a companion of Pizarro, was conqueror of Chile and founder of Santiago. He was killed by the Arancanians. See CHILE (*History*), and a book by Cunninghame-Graham (1926).

Valence, capital of the French dept. of Drôme, is on the left bank of the Rhone (crossed by an iron bridge), below the mouth of the Isère, and 66 miles by rail S. of Lyons. It contains an 11th-century cathedral (with a monument of Pius VI., who died here in exile in 1799), and several interesting Renaissance buildings. Dyeing and the manufacture of silk, glass, and iron are carried on, besides a busy trade in the produce of the Isère valley. The Roman city of *Valentia Julia* was founded in 123 B.C., and in the Middle Ages the town became the capital of the duchy of Valentinois. Justus Scaliger was a professor and Rabelais was a student at the university (1542–1789). Napoleon studied at the artillery school here 1785–91. Pop. (1921) 28,654.

Valencia, (1) a seaport of Spain, capital now of the province, and formerly of the kingdom, of the same name, stands on the shores of the Mediterranean, 3 miles from the mouth of the Guadalaviar and 200 miles SW. of Barcelona by rail. In the *Huerta* ('garden') surrounding the city the carob, citron, orange, palm, and mulberry grow in wild luxuriance, and, thanks to elaborate irrigation, four or five crops of grain can be produced annually. The old picturesque battlemented walls, erected by Pedro IV. in 1356, were removed in 1871, but two massive castellated gates date from the 14th and 15th centuries; and while, in the old quarters, the houses are closely packed and gloomy-looking, well suited to keep out the heat, those recently erected are gaily coloured and furnished with courts freshened with flowers and cooled by fountains. Valencia is the see of an archbishop, and its cathedral, commenced in 1262, but repeatedly restored, classical in the interior, and Gothic on the exterior, is 350 feet long. The church of the Colegio de Corpus is quite a museum of pictures by Ribalta. The *Lonja de la Seda* or Silk Exchange is a fine example of Gothic. The picture-gallery contains chiefly the productions of the Valencian school (Juanes, the Ribaltas, Ribera, &c.). The university has a large library. The custom-house, dating from 1758, is now a cigar-factory. Silk spinning and weaving are extensively carried on; there are also manufactures of cloths, hats, glass, linen, leather, cigars, and Valencia tiles for flooring. The exports are mainly grain, silk, rice, and fruits. Pop. (1887) 170,763; (1920) 251,258.—Valencia, or *Valencia del Cid*, dating from the second century B.C., was destroyed by Pompey, taken by the Goths in 413 A.D., by the Moors in 715, by the Cid in 1094, and finally became Christian by its capture by Jaime of Aragon in 1238. The union of Ferdinand and Isabella brought it under the Castilian crown. Suchet captured the city in 1812.—The old kingdom of Valencia, now subdivided into the three modern provinces of Valencia, Alicante, and Castellón de la Plana, comprises a tract of country in the east of Spain, washed by the Mediterranean, and extending from Catalonia to Murcia. It has a hot but fine climate, a fertile soil, mineral wealth, and many industries; see SPAIN.—(2) *Valencia de Alcántara*, a town and fortress of Cáceres province, is the frontier station on the line from Madrid (250 miles ENE.) to Lisbon (159 miles WSW.). Pop. (1920) 12,024.

Valencia, a city of Venezuela, capital of Carabobo state, lies close to the beautiful banks of the

lake of the same name, 34 miles by rail S. of Puerto Cabello. It is 111 miles SW. of Carácas, with which it is connected by rail. It stands 1577 feet above the sea-level and has a pleasant climate. Valencia has a large cathedral, and is a well-built town. There are two large cotton factories, and cigarettes are manufactured extensively. It is an older city than Carácas, having been founded in 1555. After the revolution it was the capital of the United Colombian Republic, including Colombia, Ecuador, and Venezuela, which, however, broke up in 1830.

Valenciennes, a dark, ill-built manufacturing town and first-class fortress of France, in the dept. of Nord, stands at the entrance of the Rhonelle into the Scheldt (which flows through the town in several arms), by rail 155 miles NNE. of Paris and 58 SW. of Brussels. It possesses a citadel constructed by Vauban, an hôtel-de-ville with decorated façade, and a modern Gothic church of Notre Dame with tower 272 feet high. The famous Lace (q.v.) is no longer made here, but a coarse sort is manufactured. Valenciennes is the centre of a great beet-sugar industry; there are manufactories of fine cambric, cotton yarn, hosiery, linseed-oil; and the town contains extensive and important iron-works. The country round about is a great coal-basin, with numerous pits. Valenciennes (the *Valentinianæ* or *Valentiana* of the Romans) was ceded to France in 1678, and was taken by the Allies in 1793, after a siege of 84 days, but restored again next year. From August 1914 to November 1918 it was occupied by the Germans. It is the birthplace of Baldwin, Emperor of Constantinople, of Froissart, of the sculptor Carpeaux, of the painters Watteau and Harpignies. Pop. (1921) 34,425.

Valency. See ATOMIC THEORY.

Valens, emperor of the East from 364 to 378, and brother of Valentinian I., was born near Cibalis in Pannonia about 328, and at thirty-six was chosen by his brother as his associate in the empire. He first crushed the formidable revolt of Procopius, next reduced all taxes by one-fourth. Incapable in all things of independent judgment, Valens adopted the views of his Arian councillors, and persecuted the orthodox. After some fighting with the Goths, he concluded a six years' truce with them, the Danube being agreed upon as the frontier. The years 371–377 he spent in Asia Minor, chiefly at Antioch, and conducted with as little vigour as success an indecisive war with Sapor (Shappur II.), king of Persia, closed by a discreditable truce in 376. The prophecy of some fortune-tellers that his successor should be one whose name began with *Theod* led to the death of their young dupe Theodorus as well as many innocent men who bore names with the unlucky prefix, and to a severe persecution of those who practised magic and necromancy. About 376 the Huns began to press upon the Goths, who craved permission to cross the Danube. Valens allowed them to cross, but the terms of treaty were not kept, and the Goths, under their chief Frithigern, were quickly changed to enemies by the imperial mismanagement and faithlessness. They burned and ravaged the country, and, though driven back for a time, returned reinforced by Huns and Alans, and met the emperor in battle near Adrianople, August 9, 378. The imperial army was totally routed, and two-thirds of it, including Valens himself, left dead on the field. His successor was Theodosius.

See Gibbon's *Decline and Fall*, and Hodgkin's *Italy and her Invaders*.

Valentia, or VALENCIA, a small island off County Kerry, 5 miles long by 2 broad. In some parts fairly good in soil, it has much rocky moorland, and cliffs nearly 900 feet high at the north end. The islet is chiefly notable as the European terminus of more than one Atlantic Telegraph (q.v.). The name, long held to prove that a colony from Valencia in Spain had settled here, is most likely corrupted from the Irish *Val-inch* or *Fail-inis*.

Valentine, BASIL, a pseudonym framed to imply occult mastery over the metals (*Basilius*, 'royal;' *Valentinus*, from *valeo*), was the name given to the author of a series of alchemistic works, assumed to have flourished in Germany at the end of the 15th century. Kopp (in his *Alchemie*) and Schorlemmer have proved that the actual author was Johann Thölde, who in 1612 published the *Halographia* under his own name, and in 1644 under that of Basil Valentine. A translation of *The Triumphal Chariot of Antimony* was published in 1661. See ALCHEMY.

Valentine's Day, the 14th of February, on which, in England and Scotland in former times, each young bachelor and maid received by lot one of the opposite sex as 'valentine' for the year. It was a kind of mock betrothal, and was marked by the giving of presents. From Pepys's *Diary* we see that married as well as single people could be chosen. There was an old notion, alluded to by Chaucer and Shakespeare, that on this day birds first choose their mates. The observance of St Valentine's day degenerated into the usage of youths and maidens sending each other by post prints of a sentimental kind, such as Cupids, transfixed hearts, and the like. Another form is the sending of ludicrous caricatures, often vulgar enough. In 1927 an attempt was made to resuscitate the sending of valentines, then well-nigh extinct. Several saints of this name (one of them a martyr at Rome under Claudius) were venerated on 14th February; but the observances seem to be connected rather with the spring-time than with the career or character of the saints whose name is thus taken in vain.

Valentinian, Roman emperor (364–375), was born of humble family at Cibalis in Pannonia, 321 A.D. By his capacity and courage he rose rapidly in rank under Constantius and Julian, and on the death of Jovian was chosen as his successor (February 26, 364). He resigned the East to his brother Valens, and himself governed the West with watchful care down to his sudden death at Bregetio, November 17, 375, brought on by a fit of passion. By his first wife he had one son, Gratianus (q.v.), and by the second, Justina, another son, Valentinian II., and three daughters, one of whom, Galla, became the wife of the Emperor Theodosius I.—VALENTINIAN II. was born in 372 A.D., and received from his elder brother, Gratianus, the provinces of Italy, Illyricum, and Africa, as his share of the western empire. During his long minority the empress Justina administered the government; and about three years after her death Valentinian was murdered by Arbogastes, the commander-in-chief of his army (392).—VALENTINIAN III., the grand-nephew of the preceding, being the son of Constantius III. by Placidia, the daughter of Theodosius the Great and Galla, was born about 419 A.D., and was seated on the throne of the West by Theodosius II., emperor of the East, in 425. Valentinian was a weak and contemptible prince, and never really ruled during the thirty years that he sat disesteemed and unhonoured on the imperial throne; his mother, Placidia, governed till her death in 450, and was succeeded by the eunuch, Heraclius, one of those malignant fribbles who swarmed around the throne of the falling empire. His treatment of Bonifacius made the latter throw

himself into the arms of Genseric (q.v.), chief of the Vandals, and thus lost Africa to the empire. Aëtius, the buttress of his empire, he stabbed to death in a fit of envious jealousy (454), but next year was himself slain by Maximus, whose wife he had ravished.

Valentinians, a Gnostic sect founded by Valentinus, who went from Alexandria to Rome about 140 A.D., and died there, or in Cyprus, about 160. The distinguishing feature of his system lies, in the first place, in his recognising heathenism as a preparatory stage of Christianity; and then in his dividing the higher spiritual world into fifteen pairs of æons, each consisting of a male and a female. The first pair, or syzygy, is made up of the unfathomable profundity Bythos, or God in Himself, and Ennoia, or God as existing in His own thoughts; from these emanated next Nous ('mind') and Aletheia ('truth'), Logos ('word') and Zoe ('life'), Anthropos ('man') and Ecclesia ('church'). As the last æon, Sophia ('wisdom'), transgressed the bounds that had been laid down by the æon Heros, and a part of her being became lost in Chaos, there was formed a crude being, called Achamoth (Heb. *chochmah*, 'wisdom'), which, through the Demiurgos that emanated from it, created the corporeal world. Heros now imparted to the souls of men a *pneumatic* or spiritual element, but this only attained to full activity when Christ, a collective emanation from all the æons, appeared as Saviour, and united Himself with the man Jesus. In the end all that is pneumatic, and even the originally psychic or soul element in as far as it has assimilated itself to the psychic, will return into the Pleroma. The chief Valentinians were Heracleon of Alexandria, Ptolemy, and Marcus of Palestine. There was a revival of Valentinianism in Paris at the end of the 19th century. See GNOSTICISM, and Lipsius, *Valentinus und seine Schule*, in the *Jahrbücher für Prot. Theologie* (1887); Legge, *Forerunners and Rivals of Christianity* (1915).

Valenza (*Valentia*, or *Forum Fulvii*), a town of Northern Italy, on the Po, 9 miles by rail N. of Alessandria. Pop. (1920) 10,380.

Valera, EAMON DE. See DE VALERA.

Valera. JUAN VALERA Y ALCALÁ-GALIANO (1824–1905), Spanish writer and politician, was born of good family at Cabra (Córdoba), and in the diplomatic service lived successively at Naples, Lisbon, Rio, Dresden, and St Petersburg. He next plunged into politics, contributing actively to Albarada's opposition journal, *El Contemporáneo*, and thereafter rose and fell with the fortunes of his party, as deputy, minister of commerce, plenipotentiary to Frankfurt, minister of public instruction, ambassador at Lisbon, Washington, Brussels, and Vienna, councillor of state, senator, and member of the Spanish Academy. His *Estudios críticos sobre literatura* (1864) and *Disertaciones y juícios literarios* (1882) brought him reputation; but his fame depends on his romances, *Pepita Jiménez* (1874; Eng. trans. 1891), *Las ilusiones del Doctor Faustino* (1876), *El Comendador Mendoza* (1877) and *Doña Luz* (1878). Besides these he published poems (1858), Dramatic Experiments (1878), short stories (1882), and *Cartas Americanas* (1889).

Valerian (*Valeriana*), a genus of Valerianaceæ, a family of dicotyledons containing nine genera and about 300 known species, natives of temperate climates, chiefly of Europe, the mountainous parts of India, and South America; annual or perennial herbs, sub-shrubs or rarely shrubs, with opposite leaves, destitute of stipules, and small flowers in cymes. They are nearly allied to Dipsacaceæ (see TEASEL) and Compositæ, but differ in the mode of inflorescence, and in the seeds being destitute of albumen and other intrinsic features. The genus Valeriana is distinguished by a pappus-like calyx, a spurless corolla, and three stamens. The species are pretty numerous. The common Valerian (*V. officinalis*) is abundant in ditches, moist woods, &c. in Britain, throughout Europe, and in northern Asia, and is cultivated in the United States. It has a fleshy root, pinnatifid leaves, a stem 2 to 4 feet high, and pale flesh-coloured flowers. The root is a well-known medicine, which possesses powerful antispasmodic and stimulant properties, and a very considerable influence over the nervous system (being used in hysteria, chorea, &c.). Cats are very fond of it, and it exercises a remarkable stimulating and intoxicating power over them. Although the plant grows chiefly in damp soils, the root is most powerfully medicinal in dry hilly ground. The chief ingredients of valerian are woody fibre, resinous and gum-like matters, and a little more than 1 per cent. of a volatile oil, in which *valerianic* or *valeric* acid (also obtained from several other sources) is developed on exposure to the air. Some of the salts of valerianic acid act with more certainty than the tincture and other officinal preparations.

Valeriana officinalis.

The Small Marsh Valerian (*V. dioica*) is much less powerful than the common species. The Greater Valerian (*V. Phu*) grows in alpine districts of the continent of Europe, and is perhaps the *V. dioscoridis* of the Greeks. *V. celtica* and *V. saliunca*, gathered on the mountains of Styria and Carinthia, are used in India to aromatise baths, and as a substitute for Spikenard (q.v.). *V. sitchensis*, a native of the north-west of America, possesses the medicinal properties of the genus. The root of *V. edulis*, a species found in the north-west of America, was an article of food with the Digger Indians. Corn Salad (q.v.) or Valerianella belongs to the Valerianaceæ, as does Red Valerian (*Centranthus ruber*).

Valerianus, P. LICINIUS, Roman emperor (253–260), was proclaimed emperor by the legions in Rhætia after the murder of Gallus. He was then about sixty, and he assumed as colleague his eldest son Gallienus (q.v.). Throughout his reign trouble hovered on every frontier of the empire, but as the East appeared most threatening Valerian set out at the head of an army, and was suddenly attacked and completely defeated at Edessa (260). He languished till death in hopeless captivity, subjected to all the cruelties an oriental imagination could suggest. It is said that he was tortured into betraying to Sapor the city of Antioch and the passes of the Taurus, and that after his death his skin was stuffed, painted purple, and preserved as a trophy of victory.

Valerius Flaccus. See FLACCUS.

Valerius Maximus, a Roman author, who, about 29–32 A.D., wrote in a bombastic style a somewhat miscellaneous collection of historical anecdotes. There are editions of the *Factorum*

et Dictorum Memorabilium Libri IX. by Halm (1865) and Kempf (2d ed. 1888).

Valéry, Paul Ambroise, French poet, was born in 1871 at Cette, Languedoc, and was admitted to the Académie Française in 1925. A friend of Mallarmé, he belongs to the symbolist school. His poetry, *La Jeune Parque* (1917), *Charmes* (1922), *Variété* (1924), is meditative, almost melancholy, full of harmonious imagery and subtle versification, with a lyricism both rich and delicate. He also wrote *Introduction à la Méthode de Léonard de Vinci* (1894; new ed. 1920).

Valetta (*La Valetta*), a fortress and beautiful city, capital of Malta, on the north-east side of the island. It occupies a rocky tongue of land over 3000 yards long, on either side of which are two noble harbours which are well worthy of the city's importance as chief naval station of Britain in the Mediterranean. The town and harbours are defended by a series of fortifications of great strength, many of them hewn out of the solid rock, and, mounted with the most powerful artillery, considered impregnable. The city proper on the rocky ridge has several suburbs on the other side of the harbours or on minor spits running into them. Besides the enormous forts, balconies, and battlements which are the principal architectural characteristics of the city, Valetta contains many noble edifices. The governor's palace—formerly that of the Grand-masters of the order of St John—is plain without, but magnificent within, and possesses an interesting armoury; the cathedral of St John is a superb structure; and the church of San Pubblio, with its famed *sotteraneo* ('vault') of embalmed monks and skeletons, the public library, the university, and the aqueduct, which brings water to the city from the far side of the island, a distance of 8¾ miles, are worthy of notice, as well as many of the palazzi of the Maltese nobles. There is a railway to Citta Vecchia, the old capital, about 8½ miles W. in the interior. The city was named after the Grand-master La Valette, though there were fortifications and dwellings here long before his date. Valetta is the centre of the commerce of the island, and is the headquarters of the British garrison. The climate is mild and sunny. Pop. (1921) 48,240.

Valette, Jean Parisot de la, born in 1494 of a noble family of Toulouse, entered the order of the Knights of St John, of which order he was elected Grand-master in 1557. His life thenceforward is a series of exploits in warfare with the Turks, culminating in his famous defence of Malta, lasting from 18th May 1565 till 8th September. The Turks had 159 war-ships and 30,000 men; the defenders were 8500 men, with 700 knights, and unsupported held the fortifications heroically in spite of awful loss and privations, till the approach of a Neapolitan fleet caused the Turks to raise the siege. The veteran commander died 28th August 1568. See Malta, Hospitallers.

Valguarnera Caropepe, a town of Sicily, 16 miles E. by N. of Caltanisetta. Pop. (1921) 16,992.

Valhalla, Valkyrjur. See Scandinavian Mythology, Walkyries.

Valla, Laurentius, a great humanist of the Renaissance, was born in 1405 at Rome. There, and afterwards at Florence, he studied the classics, which he taught chiefly at Pavia. Having incurred many enmities, he shifted his quarters from one university town to another, much to their advantage and his own, till he found a protector at Naples in King Alfonso V., whose military fortunes he shared by sea and land. Rehabilitating Epicurus against scholastic depreciation, he was expelled from Rome, whose claims to temporal power he attacked. Continuing to lead an actively controversial life, he was prosecuted by the Inquisition in the diocese of Naples, but underwent neither condemnation nor punishment. In 1448 we find him again in Rome as apostolic secretary to Nicholas V., whom he eulogised as 'the common father of the learned.' He died 'worn out by continual alternations of humiliation and redress,' in the flower of his age, in 1457. His vagrant, agitated life considered, he wrought marvels for scholarship and literature. Latin style (as commemorated by George Buchanan in two famous epigrams) owes him the deepest debt, while his Latin versions of Xenophon, Herodotus, and Thucydides, made from texts which he had himself to purify, if not actually construct, extort admiration. His scientific insight into language and idiom was only less than his gift of eloquence and invective. New Testament criticism he signally advanced by his comparison of the Greek original with the Vulgate. His *Elegantiæ* of Latin speech was long a class-book in the schools; while his *De Donatione Constantini Magni* remains a weapon valued by assailants of the temporal power.

See Mancini's brilliant and exhaustive monograph (Florence, 1891) for the investigation and settlement of disputed points in Valla's life, and Symonds, *The Renaissance in Italy* (1877).

Valladolid, a famous city of Spain, sometime capital of the whole country, and still capital of a province of Old Castile (q.v., and see Spain), stands on a plain on the left bank of the Pisuerga, 151 miles NW. of Madrid by rail. It is 2200 feet above sea-level, and has a healthy climate, the air being pure and the sky generally cloudless. The Museo has a valuable collection of native statues, carvings, and sculptures. The Classical cathedral, planned by Herrera (1585), was never finished; there are several other churches, few of them of any distinction. Of the once numerous monasteries the Dominican house, with an elaborate late Gothic façade, is now a house of correction, and that of the Benedictines is a barrack. The university dates from the 11th century; there is an English College; while the Scots College was long the only seminary for the education of Scots Catholics; see Scotland (Ecclesiastical History). Some of the squares are very large. The city, which contains a royal palace and many other public buildings, is fortified. Silk, cotton, and woollen stuffs, jewellery, hats, paper, perfumery, chemicals, gloves, &c., are manufactured; there are iron-foundries and locomotive works. The province is a great corn-field. Pop. (1887) 62,018; (1920) 76,791. Valladolid, the *Pincia* of Ptolemy, is first mentioned as *Vallisoletum* in 1072. Charles V. erected many splendid edifices here. About this time Valladolid was the most prosperous city in Spain, containing 100,000 inhabitants. Formerly capital of Castile and León, it was still the usual residence of the kings. In 1560, under Philip II. (who was born here), Madrid was declared the only court; and, after a revival under Philip III., subsequently the prosperity of Valladolid declined. In 1808 it was sacked by the French, and much damage done to buildings and pictures. Trade and commerce have made Valladolid in the 20th century quite a busy place again. Christopher Columbus died here in 1506, and Cervantes wrote part of *Don Quixote* here.

Valladolid, a small town of Yucatán, founded in 1543, 90 miles ESE. of Mérida. See also Morelia.

Vallauri, Tommaso (1805-97), Latinist, was born at Chiusa di Cuneo, and in 1843 became professor at Turin. He published editions of numerous Latin classics, including Plautus, Horace, Cicero,

Sallust, Curtius, in whole or in part, besides dictionaries, epitomes, books on the literature of Piedmont, and an autobiography (1879).

Vallejo, a port of California, on San Pablo Bay, 31 miles by rail NE. of San Francisco. It has a good harbour, ships large quantities of grain, and contains shipyards and several factories. Here, on Mare Island, is a navy-yard. Pop. (1920) 21,107.

Valleyfield, a town of Quebec, on the St Lawrence, 34 miles by rail SW. of Montreal. A fall of 15 feet supplies water-power, and the place contains cotton, paper, and saw mills, furniture factories, and machine shops. Pop. (1921) 9215.

Valleys, low-lying or hollow tracts on the earth's surface between mountains or elevated ground. They are generally parallel to the direction of the ridges; but some are transverse, cutting through mountain-chains. As a rule they have a water-course at or near their lowest level. The origin of valleys and their growth are dealt with in numerous articles in this work: see EARTH, DENUDATION, GEOLOGY, MOUNTAINS, LAKE, and especially RIVER; besides those on notable valleys, as that of the Colorado, Yosemite, &c., and the mountain-systems which enclose such—Alps, Appalachians, &c.

Vallisneria, a genus of Hydrocharidaceæ. *V. spiralis*, found in fresh-water lakes and streams in the tropical and warm regions of the earth, is particularly celebrated on account of its peculiar process of pollination. At the time when this is to take place the flowers of the female plants rise

Vallisneria spiralis:
A, female plant; *a*, female flower; B, male plant.

to the surface of the water by means of their long spirally-twisted stalks. The flowers of the male plants, in order to follow them thither, become detached, having previously grown on short stalks at the bottom of the water, and expand, liberating their pollen, which, floating about upon the surface, comes in contact with the female flowers which are stationary. The female flowers are submerged again by the spiral contraction of their stalks, and the fruit is ripened under water. This plant is frequently grown in aquaria. Considerable depth of water should be provided for it, as the leaves are long, and should always be submerged. A second species inhabits Southern Asia and Sokotra.

Vallombrosa ('Shady Valley'), a celebrated abbey among the Apennines, 15 miles E. of Florence, in a valley surrounded with forests of fir, beech, and chestnut trees. Here an order of monks was founded about 1040, with a rule based on the Benedictine. It became very wealthy through donations, and the present magnificent buildings, dominated by a lofty tower, were begun in the 15th century, restored and enlarged in the 16th, and finished in the 17th, the church belonging entirely to the latter. In 1810–17 the monastery was suppressed, and again, finally, in 1866. It was occupied by the National School of Forestry (1867–1913), and is now used for summer courses. The place is a favourite summer resort, with large hotels. Vallombrosa was visited by Dante, celebrated by Ariosto in *Orlando Furioso*, and is mentioned by Milton in *Paradise Lost*.

Valls, a manufacturing town of Spain, 12 miles N. of Tarragona. The French defeated the Spaniards here in 1809. Pop. (1920) 10,689.

Vâlmîki, the reputed author of the Râmâyaṇa (q.v.).

Valmy, a French village in the department of Marne, 20 miles NE. of Châlons. Here on 20th September 1792 took place the famous 'cannonade of Valmy,' in which the Prussians under the Duke of Brunswick maintained for some hours a heavy fire on the army of the republic, and then retreated (see DUMOURIEZ). The loss was trifling on either side; but Valmy has not unjustly been treated by Creasy as one of the great battles of history, inasmuch as it was the first triumph of the republican arms—a triumph by which, with characteristic impulsiveness, the French were transferred from the depths of despair to the very pinnacle of self-confidence. When Napoleon was creating his 'noblesse' this great service rendered to France by Kellermann was fitly remembered by his title of *Duc de Valmy*.

Valois, HOUSE OF. See FRANCE. The ancient Valois, first a county, then a duchy, now forms part of the depts. of Oise and Aisne.

Valona. See AVLONA.

Valonia, a vegetable product very extensively used by tanners, in consequence of its being rich in tannic acid. It is the acorn-cup of a species of oak (*Quercus Ægilops*) indigenous to the Levant. It is largely exported from Asiatic Turkey and to a less extent from Greece.

Valparaíso, so named by its founder Juan de Saavedra in 1536, from his native village in Old Castile, the second city of Chile and next to San Francisco the principal American port on the Pacific, is situated on the bay of the same name, 115 miles by rail WNW. of Santiago, and 881 W. of Buenos Aires by the Trans-Andine Railway. The bay is horseshoe shaped, open towards the north, and in winter a dangerous anchorage. The city is built chiefly upon a gently sloping plain at the head of the bay, which is, however, cut up by many ridges of hills that terminate in bluffs near the water's edge, and that are often so steep as to require staircases to pass from one part to another. Valparaíso was never a well-built town, and the ravages of the earthquakes have prevented the erection of good buildings. The old town, El Puerto, contains the vast customs warehouses, huge elevators, the mole and harbour, wharves, the exchange, post-office, and municipal palace, with a bronze statue of Lord Cochrane in the plaza in front; above it rises the Cerro Alegre, with a Protestant church and the pretty houses of some of the foreign merchants. In the eastern portion of the city, where the houses are mostly of one story, are the theatre and railway station. Batteries crown the heights and also guard the harbour. In Spanish days Valparaíso, though a busy port, did not make much progress, and at the beginning of the 19th century had a population of only 5000. It was plundered by Drake in 1578 and was long troubled by attacks of English and Dutch pirates.

In 1866, owing to a dispute with Spain, the Spanish fleet bombarded the town and did damage amounting to ten million dollars Its sufferings were worse during the civil war of 1891. In that year the revolutionary troops, after defeating the Balmacedists, occupied the city and committed fearful outrages. Valparaiso was almost entirely destroyed by an earthquake in 1906; nearly 1000 people were killed, and the damage was estimated at twenty millions sterling. Pop. (1920) 182,422.

Valpy, Richard, D.D., was born in Jersey, 7th December 1754, and had his education at Valognes in Normandy, Southampton grammar-school, and Pembroke College, Oxford. He took orders in 1777, was the successful head-master of Reading grammar-school (1781–1830), as well as rector of Stradishall in Suffolk from 1787, and died at Kensington, 28th March 1836. His Greek and Latin grammars carried his name far beyond the bounds even of the large influence of a head-master of fifty years.—His brother, Edward Valpy (1764–1832), was head-master of Norwich School from 1810, and left *Elegantiæ Latinæ* (1803), and an edition of the Greek Testament (3 vols. 1810).

Valtelline (Ital. *Val Tellina*, Ger. *Veltlin*), the rich and fertile valley of the Upper Adda down to its influx into the Lake of Como. In a wider sense the term covers the whole of that part of Lombardy which includes this valley, as well as Chiavenna and Bormio, corresponding to the modern province of Sondrio. The 120,000 inhabitants speak a dialect of Italian akin to Romansch (q.v.). In the 16th century the district became subject to the Swiss canton of Grisons (q.v.); the latter, however, steadily resisted the efforts of the Valtellines to secure citizenship, and the bloody Valtelline War (1620) resulted. The Grisons was victorious, and governed the Valtelline more oppressively than ever, till, at the petition of the inhabitants, Napoleon incorporated the country with the Cisalpine Republic, and the Valtelline has since shared the fortunes of Lombardy and Italy, being united with the latter in 1859, with the exception of the side valley of Poschiavo, which is still Swiss.

Valuation is the process of fixing the price or rent to be paid for a piece of property. Surveyors and valuers are often called upon to advise persons who propose to become purchasers, lessees, or mortgagees of real estate; trustees are, generally speaking, bound to take a professional opinion before advancing trust moneys on the security of land, &c. When property is required as a qualification for a franchise or office the law prescribes the rules for ascertaining the value. Again, property must be valued in order to determine the taxation to which it is subject; thus the whole property of a deceased person is valued for probate and succession duty. Domesday Book (q.v.) contains a valuation for feudal purposes of the lands of England, except the four northern counties. When revenue was raised by means of subsidies the burden was distributed 'according to the faculties of men'—i.e. according to ability to pay: land, offices, and personal property were all valued for taxation. In 1692 a new valuation was made for land-tax, and lands continued to be assessed as in that year until the Act of 1798 by which the old land-tax was rendered permanent, and means were provided for its gradual redemption. The true land-tax of our own day is the landlord's property-tax collected under schedule A of the Income-tax Act. See Griffith's *Valuation.*

Valuation Roll in Scotland.—A valuation of lands appears to have been made in Scotland as early as the reign of Alexander III. in the 13th century. This valuation, or tax-roll, came to be known as the 'Old Extent.' During the 14th century a new valuation—known as the 'New Extent'—was established by authority of parliament. Under Cromwell, and after the Restoration, the total sum to be raised by taxation levied on land was first fixed, and then distributed among the counties, commissioners being appointed with power to alter the old valuation. The rent thus arrived at is commonly called the 'valued rent,' and formed the basis on which taxation was levied on land till 1854. Under the Lands Valuation Act of that year provision was made for the establishment of a uniform valuation of lands and heritages in Scotland, and the compilation of valuation rolls, by means of which all local public assessments leviable according to the real rent might be assessed and collected, and for the annual revision of such valuation. By subsequent statutes the valuation roll was adopted as the basis for the registers of voters in counties and burghs respectively. The form of valuation roll now in use was introduced by the Registration Act, 1885. In order to the making up of the roll the county council—coming in place of the Commissioners of Supply—in each county, and the magistrates of each royal or parliamentary burgh, appoint an assessor, whose duty it is to make up annually a valuation roll showing the value of the several lands and heritages within the county or burgh respectively, other than the lands and heritages of railway and canal companies, which appear in a separate roll made up by the Assessor of Railways and Canals. The assessment roll of a police burgh is made up from the county valuation roll. The Rating (Scotland) Act, 1926 (16 and 17 Geo. V. chap. 47), enacts that a county council shall not levy, under the provisions of the Local Government (Scotland) Act, 1889, or of any other public general act, any rate within any police burgh which, for the purpose of any such act, is held to be within the county. The Rating Act of 1926 also provides (sec. 14) that every valuation roll made up in accordance with the Lands Valuation Act, 1854, or the Burgh Police Act, 1903, shall, in addition to other particulars required by these acts, show the rateable value of the lands and heritages and the amount of any deduction from the gross annual value for the purpose of ascertaining the rateable value. An appeal lies from the valuation of the assessor to the county or burgh valuation committee. If either the assessor or the party appealing to the committee is dissatisfied with the decision of the committee, he may appeal, on a case stated, to the Lands Valuation Appeal Court, consisting of three judges of the Court of Session.

Value, one of the fundamental conceptions of political economy, has been the subject of many controversies, and has been variously defined. Usefulness (or utility) alone does not determine value in the economic sense. Air is eminently useful, but it is not valuable in that sense: hence 'value in use' is distinguished from 'value in exchange,' and the latter is treated as the only meaning relevant to economic science. Mill stated that value depends on utility and difficulty of attainment, and established three laws of value, varying as the objects dealt with were (1) absolutely limited in quantity, like pictures by a dead artist; (2) capable of being increased by proportionally greater labour, like agricultural produce from a limited area; (3) capable of being increased indefinitely without increased cost of production. Ricardo's too abstract doctrine was held by certain socialistic writers to imply that value depends simply on the quantity of labour expended, regardless of interest, profits, &c. Such a conclusion is questionable, but it is true that Ricardo paid but

little heed to the influence of demand in the determination of value. Later in the 19th century Jevons, followed by the Austrian economists, went to the other extreme, holding that value depends entirely upon utility. This school stressed the importance of the principle of 'final' or 'marginal' utility in its relation to value, and profoundly influenced Marshall, whose *Principles of Economics* (first published 1890) is the most important modern contribution to the study of value. It is generally accepted that value depends on the working of the laws of Demand and Supply (q.v.) in their various forms. There is no absolute standard of value, as any standard chosen must itself be subject to the laws of demand and supply. So far, however, the precious metals have supplied the least unsatisfactory standard (see MONEY).

On the wide subject of value generally, see Ricardo, Mill, Cournot, Fawcett, Jevons, Marshall, and other writers cited at POLITICAL ECONOMY; also W. Smart, *Introduction to the Theory of Value* (1891); for surplus value, MARX, SOCIALISM.

Vambéry, ARMINIUS, traveller and philologist, was born at Szerdahely in Hungary, 19th March 1832. At twelve he was apprenticed to a ladies' dressmaker, but afterwards took to teaching. Next he entered a school at St George, Presburg, helped by various friends; he was soon able to speak Latin with fluency. In 1846 he entered a school at Coronation, where he struggled to support himself, undaunted by want and privation. His holidays were spent in tramping through the country; at sixteen he was conversant with several languages. A strong desire for eastern travel led him to Constantinople, where he applied himself to the study of Oriental languages. In 1858 he issued a German-Turkish dictionary. He was made corresponding member of the Hungarian Academy, and in 1861 he received a travelling stipend of a thousand florins. In 1862–64 he travelled in the disguise of a dervish, by routes unknown to Europeans, through the deserts of the Oxus to Khiva, and thence by Bokhara to Samarkand. His position precluded him from making instrumental observations for the purposes of geography, but was eminently favourable to an insight into the customs and language of the peoples visited. His valuable *Travels and Adventures in Central Asia* (Lond. 1864) was written out in three months from meagre pencil notes on scraps of paper. He strenuously supported the idea that the rule of England in the East is most beneficent, that of Russia the least so, repeatedly visiting England and lecturing on this subject. He died in September 1913.

His other publications were partly philological and ethnographical, partly also historical and political. To the former belong his works relating to the Eastern Turkish and Tatar languages, such as the ethnography of the Turks, the origin of the Magyars, &c., whilst the latter comprise his *Wanderings and Adventures in Persia* (1867); *Sketches of Central Asia* (1868); *History of Bokhara* (1873); *Central Asia* (1874); *The Origin of the Magyars* (1882); *Arminius Vambéry, his Life and Adventures* (1883); and *The Story of my Struggles* (1904). His family was of Jewish origin, the name being a Hungarian corruption of Bamberger, but he himself became a convert to Bahaism. He was a contributor to *Chambers's Encyclopædia*.

Vampire. One of the most gruesome superstitions in the world is that of the Vampire, of the dead leaving their graves to destroy and prey upon the living. It is characteristically Slavonic, though by no means exclusively so, and it is strongest of all in White Russia and the Ukraine. It still dominates the popular imagination in Russia, Poland, Serbia, Czechoslovakia, and also in a less degree in Albania and Greece. The modern Greek term for a vampire is *βουρκόλακας*, which Bernhard Schmidt identifies with the Slavonic name of the werwolf (Bohemian, *vlkodlak;* in Bulgarian and Slovak, *vrkolak*), the regular name for a vampire in Serbia being *vukodlak*. The Russian *vampir* (South Russian, *upuir*, anciently *upir;* Polish *upior*) in his earthly life was a wizard, a witch, a werwolf, a suicide, or one cursed by his parents or the church. But even an innocent man may involuntarily become a vampire by himself falling a victim to one, or merely by a cat or a bird accidentally crossing his corpse before its burial. And we find a survival of this notion in Henderson's account of how the Northumbrians at once put such a cat to death. Such bodies do not decay in the kindly earth, for when a vampire's grave is opened no trace of death is seen on the corpse; he lies turned in his grave, with fresh cheeks, open staring eyes, the skin, hair, and nails still growing. During the night he rises from his grave and sucks the blood of sleepers, who pine and die while he draws his nourishment from their life. He can only be laid to rest by a stake (in Russia of aspen) being driven through his body at a blow—a custom only abolished in the case of suicides in England by 4 Geo. IV. chap. 52. Sometimes when he first awakes in the grave to his unhallowed shadowy life he begins to gnaw his own hands and feet, or to chew his shroud, causing his kindred to pine away and die. In many cases such witches only devour the hearts of their victims, or steal them out of their bodies, substituting for them the heart of a cock or a hare, and so destroying the nature. The stolen heart they expose over a magic fire in order to create hopeless love-longings in the breast from which it was taken—an idea which Jakob Grimm says lies at the foundation of our metaphorical phrases within the vocabulary of love of 'giving' or 'stealing one's heart.'

Such a notion of a nocturnal demon eating out the souls or hearts and sucking the blood of men gives to the primitive mind a natural and rational explanation of such phenomena as a patient seen becoming from day to day, without apparent cause, thin, weak, and bloodless. We find it widely prevalent in popular folklore, and imbedded in the doctrine of folk-medicine, sorcery, and witchcraft everywhere. The likeness to the corpse-eating *ghouls* of Oriental folklore is apparent, and to the superstition of the Werwolf (q.v.). Teutonic mythology has parallels enough of animated corpses returning to satisfy a thirst for blood or their carnal appetites, and it is a commonplace of popular folklore that it is fatal to meet a *revenant* of any nature.

See Ralston's *Russian Folk-tales* (1873); Hertz, *Der Werwolf* (1862).

Vampire Bat. Most of the bats called vampires (see BAT) are frugivorous or insectivorous and harmless to mammals. The real blood-suckers belong to the genera Desmodus and Diphylla, forming the family Desmodidæ, found in Central and South America. These are small bats with a bifid nose-leaf, two large projecting incisor teeth, and two lancet-shaped upper canines and a narrow gullet. They attack cattle and horses and sometimes human beings when asleep.

Van, a town of Turkish Armenia, stands near the south-eastern shore of Lake Van, 145 miles SE. of Erzerum, in a very fertile plain on the borders of Armenia and Kurdistan; pop. 30,000, mainly Turks, with some Armenians and Kurds. The VANNIC INSCRIPTIONS, otherwise called Proto-Armenian and Khaldian, are the cuneiform records of a kingdom, the capital of which was at Van and which lasted from B.C. 840 to 620. The characters were borrowed from Assyria, but were

considerably reduced in number. The language, which was deciphered by Sayce in 1882, is semi-inflexional and is perhaps allied to Georgian. The kingdom was called Biainis, from which the classical Byana and modern Van are derived; the city was Dhuspas, whence the name of Lake Thospitis. The inscriptions are nearly all on stone and relate either to history or to religion. The founder of the kingdom was Sarduris I. His successors were Ispuinis and Menuas, the last of whom annexed the valley of the Araxes and extended his empire from Lake Urumiyeh to Malatiyeh on the Euphrates. After him came Argistis I., the founder of Armavir and conqueror of the Assyrians, Sarduris II. (overthrown by Tiglath-pileser), Rusas I., builder of a palace at Toprak Kala, Argistis II., Rusas II., to whom the murderers of Sennacherib fled, Erimenas, Rusas III., and Sarduris III. The Vannic kingdom was overthrown by the Indo-European Phrygians about B.C. 620. Its supreme god was Khaldis, who with the Sun-god and the Air-god formed a trinity. The people of Van were called the sons of Khaldis, and a special cult was paid to the vine.—The LAKE OF VAN is a considerable inland sea, 80 miles long and about 30 in breadth; area, 1200 sq. m. It has no visible outlet. In its brackish waters a kind of bleak is caught, salted, and exported.

Vanadium (sym. V; atom. number, 23; atom. wt. 51·2), a rare metal possessing a silvery lustre, and having a specific gravity of 5·5. The name was first given to the vanadiate of lead, discovered by Del Rio in 1801, but it was not till 1867 that the metal itself was prepared by Roscoe. It burns readily in a flame or when heated in oxygen. It is used for making aniline black, in colouring porcelain, in metallurgy. It adds greatly to the hardness of steel (see IRON AND STEEL, p. 225).

Vanbrugh, SIR JOHN, dramatist and architect, was the grandson of a Protestant refugee of Ghent, and the son of a Cheshire sugar-baker, and was christened in London, 24th January 1664. He was educated in France, and hardly had he returned than his wit, his handsome figure, and his geniality won for him a footing in society. In 1695 he was made one of the commissioners for finishing the palace at Greenwich for the purposes of a hospital. His first plays were the *Relapse, or Virtue in Danger*, brought out at Drury Lane with great success in 1697, and the *Provoked Wife*, produced at the theatre in Lincoln's Inn Fields. He then in partnership with Congreve started an unsuccessful theatre in the Haymarket, and there brought out the *Confederacy*. In 1702 he built Castle Howard in Yorkshire for the Earl of Carlisle, and such was now his reputation that he was commissioned to erect Blenheim House. The queen supplied from her private purse the money required, and Marlborough left a fund to meet the architect's claims, but the imperious duchess not only refused to pay Vanbrugh his salary, but dismissed him from his office. Finally he got nearly all the money that was due to him, but naturally ever after was the sworn foe of the Duchess of Marlborough. In 1714 he was made comptroller of royal works, was knighted at the accession of George I., acted as Clarencieux king-at-arms from 1705 to 1725, and died at Whitehall, March 20, 1726, leaving his *Provoked Husband* unfinished. Vanbrugh's plays lack the polish and refinement of Congreve's, but are free from his artificiality and laboured brilliancy. The interest is well sustained throughout; the characters are real, natural, and racy, the situations striking, and the dialogue bright and vigorous. But he is grossly indecent beyond all the allowable bounds of humour. See the edition by W. C. Ward (1893), and select plays by Swaen (1896); also the monograph by Barman on his architectural works (1924); and B. Dobrée's *Essays in Biography* (1925).

Van Buren, MARTIN, eighth president of the United States, was born 5th December 1782, the son of a small farmer, at Kinderhook, New York. He became office-boy to the village lawyer, studied hard, and was called to the bar in 1803. In 1812 and 1816 he was elected to the state senate, and in 1815–19 he was state attorney-general. In 1821 he entered the United States senate, of which he was a member until his election in 1828 to the governorship of New York. In the same year he zealously supported Jackson for the presidency, and in 1829–31 was his secretary of state. Two years later he was elected vice-president, and in 1835 president, but by a popular majority of less than 25,000, and that largely owing to his declared opposition to the 'slightest interference' with slavery. During a financial panic he wrung from congress its assent to a measure for a treasury independent of private banks. This and his firm adherence to obligations of neutrality during the Canadian rebellion of 1837 are his most statesmanlike acts, but both cost him popularity and votes: in 1840 he and his party were overwhelmingly defeated by the Whigs. He lost the nomination in 1844, because he opposed the annexation of Texas; and his nomination by the Free Soil party in 1848 only secured the return of the Whig candidate. He died 24th July 1862. Van Buren was a master of the politician's arts, but he used his great skill for what he counted the highest ends; he often ranged himself on the unpopular side—favouring negro suffrage, and opposing an elective judiciary. A loyal Jefferson Democrat, he yet cherished warm private friendship with great opponents such as Henry Clay.

See Lives by W. L. Mackenzie (1846), E. M. Shepard (1888), and George Bancroft (1889).

Vancouver, the chief city and commercial capital of the province of British Columbia, the terminus of the Canadian Pacific and the Canadian National Railways; stands on the south shore of Burrard Inlet, one of the best deep-water harbours on the west coast of America, and stretches southward to the north arm of the Fraser River. It is 2906 miles by rail from Montreal. Its site was a dense forest till 1885, but it is now a splendidly laid-out city with an extensive electric tram system, which includes a line to Chilliwack, in the heart of the dairying and fruit-growing district of the Fraser River, 65 miles distant. Electricity is mainly the lighting power in use, gas being used chiefly for cooking. There is an immense amount of water-power available within easy distance of the city. There is a university; but Stanley Park, on a peninsula extending into the inlet, is the pride of the city, claiming to be the finest in the Dominion, and one of the finest in the world; there are also about fifteen other parks. There are many very fine buildings, including a post-office; also hospitals, churches, theatres, and banks. Vancouver has manufactories of lumber, sugar-refineries, and is a busy commercial centre. It has extensive wharves, warehouses, &c., and a large trade is done coastwise, both north and south, especially in flour, grain, and lumber, while there are many steamship lines to the Orient and Antipodes. To keep up with the enormous growth of the shipping trade, the Second Narrows Bridge (carrying a railway line) was completed in 1925, connecting Vancouver with North Vancouver across the inlet. The north shore now possesses important dry docks, grain elevators, wharves, coal bunkers, &c., water frontage on the south shore being now limited in extent. Pop. (1901) 26,133; (1911) 100,333; (1921) 117,217.

Vancouver Island, belonging to British Columbia, lies in 48° 19′—50° 53′ N. lat. and 123° 17′—128° 28′ W. long., and is separated from the mainland by Queen Charlotte Sound, Johnstone Strait, and Strait of Georgia, which taken together form an open sea-way. The island is 278 miles in length, and from 50 to 65 miles in breadth; area, about 15,000 sq. m.; pop. 130,000. Its outline is boldly picturesque. The shores are marked by abrupt rocky cliffs and promontories, by pebbly beaches and sheltered coves, with fine harbours. The western shores are gloomy and frowning in aspect, deeply indented by fiord-like arms of the sea, the banks of which are formed by steep rocks rising like walls. The whole country is more or less densely wooded, except where the mountain-summits afford no foot-hold for plants, or where open grass-lands occur. There are no navigable rivers, and the streams, which are torrents in winter, and are nearly dry in summer, are short, and are valuable only as supplying power for mills. The climate resembles that of southern Britain; the warm current striking the coast preserves a mild and agreeable temperature; and in the south-east, where there is much less rain than in the north or on the mainland, snow seldom falls. The lumber products of Vancouver Island are of great importance; a large number of timber and pulp mills are situated along the coast. Only a small proportion of the surface is suited for agriculture, though farming settlements are extending in forest clearings. Fruit-culture is profitably carried on in the south, and there is some dairy-farming. The island is very rich in minerals. Besides gold, silver, copper, iron, &c., it possesses great fields of excellent coal, at Nanaimo in particular. Railway communication in the south of the island is extending. Good fishing banks lie off the west coast, where numerous canning factories have been established. Fish and valuable fish products are exported from Victoria (q.v.), the capital. Esquimalt (q.v.), a naval station, has an admirable harbour, with docks and fortifications.

The island was discovered in 1592 by Juan de Fuca, and visited in 1792 by Captain George Vancouver (1758–98), an officer in the British navy; but the first permanent settlement was not made till 1843, when the Hudson's Bay Company built a fort and trading post where Victoria now stands. Its later history, along with other information, will be found at COLUMBIA (BRITISH).

Vandals, a Teutonic race, settled at their first appearance in history in the north-east of Germany in the region between the Vistula and the Oder. Thence they moved southward, suffered severe defeats from Aurelian, and later from the Goths under Geberich, and were permitted by Constantine to settle in Pannonia, where they became Christians of the Arian pattern. But at the beginning of the 5th century, urged, said his enemies, by Stilicho, they entered Gaul, and crossed the Pyrenees into Spain in 409. The Asdingian section settled in Galicia, and were almost entirely destroyed in the struggle with the Goths and Suevi; the Silingian Vandals, together with the allied Alans, settled in a part of Bætica, which received from them the name of *Vandalitia* (Andalusia). In 429, on the call of the rebel to the empire, Bonifacius, governor of Africa, they crossed the Strait of Gibraltar, under their dreaded leader, Genseric (q.v.), carrying such devastation and ruin from the shores of the Atlantic to the frontiers of Cyrene that their name has lived on the lips of man for fourteen centuries. After the death of Genseric (477) his son, Hunneric, cruelly persecuted the Catholics, and kept the Mediterranean in terror by his piracies. His successors, Guntamund (d. 496) and Thrasamund (d. 523), were comparatively mild and tolerant rulers, but luxury had already begun to weaken the fibre of the ancient Vandals. Hilderic showed such strong leanings towards Catholic orthodoxy that his subjects grew discontented, and he was overthrown by his uncle, Gelimer, in 530. The Emperor Justinian sent Belisarius against the latter in 533, and the year after he surrendered, and was carried to Constantinople in triumph. Most of the Vandals were drafted into the imperial army, and sent to perish in the endless wars with Persia.

See the various histories of the Roman Empire, but especially Papencordt, *Geschichte der vandalischen Herrschaft in Africa* (Berl. 1837); also Felix Dahn's *Könige der Germanen* (part i.) and Hodgkin's *Italy and her Invaders* (vols. ii. and iii.). See also Wrede, *Ueber die Sprache der Wandalen* (Strasb. 1886).

Vandamme, DOMINIQUE JOSEPH, general, was born 5th November 1771 at Cassel, in the dept. of Nord, and during the revolutionary war was distinguished as commander of the Chasseurs de Mont-Cassel. In 1799 he was a general of division, fought at Austerlitz, reduced Silesia in 1806 and 1807, and repeatedly commanded an army corps, but was defeated and taken prisoner at Kulm in 1813. He held a command during the Hundred Days, and after the second restoration was exiled, but returned from America in 1824 to die at Cassel, 15th May 1830. See the Life by Du Casse (1870).

Vanderbilt, CORNELIUS, was born on Staten Island, New York, in 1794, and at the age of sixteen bought a boat and ferried passengers and goods across to the city. Gradually extending his enterprise, by the age of forty he had become the owner of beautiful sound and river steamers running to Boston and up the Hudson; in 1849 he founded a line, *viâ* Lake Nicaragua, to California, and during the Crimean war he established a line of ocean steamships to Havre. A little later he transferred his capital from steamships, and at the age of seventy entered on a great career of railroad financing, gradually obtaining a controlling interest in a large number of roads, until he extended his system to Chicago. The Grand Central depôt in New York City was erected by him. At his death in 1877 he left a fortune of some $100,000,000, nearly all to his eldest son; shortly before he had given $1,000,000 to found Vanderbilt University at Nashville.—His son, WILLIAM HENRY (b. 1821), had been business manager of his father's railroads, and afterwards greatly extended the Vanderbilt system. He died in 1885, and was succeeded by his two eldest sons, Cornelius (1843–99) and William Kissam, his principal heirs. See Croffut, *The Vanderbilts and the Story of their Fortune* (1886).

Vanderdecken. See FLYING DUTCHMAN.

Van der Goes, HUGO, a Flemish painter of the school of Van Eyck, was born in Ghent, and was dean of the painters' guild there in 1473–75. Soon after he withdrew to a monastery at Soignies, where he died bereft of reason in 1482. Only one of the works attributed to him—a triptych in the hospital of Santa Maria Nuova at Florence, consisting of an adoration of the infant Christ by the Virgin, with portraits—is indisputably genuine. The famous Stewart triptych at Holyrood is believed by good judges to be his. See a book by Joseph Destrées (Brussels, 1914).

Vandevelde, WILLIAM, the Elder, was born at Leyden about 1611. Till 1657 he practised his calling as a marine painter at Amsterdam, then settled in England, and became painter of sea-fights to Charles II. and James II. He died in London in 1693.—WILLIAM VANDEVELDE, the Younger, was born at Leyden or at Amsterdam in 1633, and in due time followed his father to England, where

Charles II. employed him and gave him a pension of £100 a year. He died at Greenwich, 6th April 1707, leaving behind ample justification for his fame as one of the greatest of marine painters. Smith catalogues 330 of his paintings.—ADRIAN VANDEVELDE, his brother, born at Amsterdam in 1639, gained high estimation as an animal and landscape painter, and died 21st January 1672. See E. Michel, *Les Van de Velde* (1892).

Van Diemen's Land. See TASMANIA.

Van Dyck, SIR ANTHONY, portrait and history painter, was born at Antwerp, 22d March 1599, the seventh child of Frans Van Dyck, a silk and woollen manufacturer of the city, and his second wife, Maria Cuypers, a lady celebrated for her skill in embroidery. In 1609 he entered the studio of Hendrik Van Balen, a capable painter of the place; in his fifteenth year he began to study under Rubens, and in 1618 he was admitted a master of the Antwerp Guild of St Luke. He soon came to be recognised as the most promising of the pupils of Rubens. In the contract, dated 1620, for the decoration of the Jesuit Church of Antwerp it was stipulated that he was to assist his master in the production of thirty-nine pictures; and the 'Christ Bearing the Cross,' in the church of the Dominicans, may be referred to as a work of this period. In 1620 the Earl of Arundel was advised that 'his works are beginning to be scarcely less esteemed than those of his master;' and in the end of that year Van Dyck made a brief visit to England, when he appears to have executed the full-length of James I. at Windsor. In 1623, by the advice of Rubens, he started to study in Italy; and, on his way, he is said to have fallen in love with a beautiful country girl of the little village of Saventhem, near Brussels, and to have delayed there, painting his famous 'St Martin dividing his Cloak,' still in the parish church, and a 'Holy Family,' since lost. The investigations of M. A. Wauters and other critics, however, have thrown doubt upon the details of this traditionary episode in the painter's life.

Arrived in Venice, he devoted himself to an enthusiastic study of the masterpieces of Titian, Giorgione, and Veronese; and, passing to Genoa, he executed there a series of noble portraits, strongly impressed with the influence of Italian art, many of which are still preserved in the palaces of the families for whom they were painted. In Rome he resided for nearly two years, producing a 'Crucifixion' for Cardinal Bentivoglio, and for the pope an 'Ascension' and an 'Adoration of the Magi.' After visiting Turin and Sicily, he again worked in Genoa, and by 1628 he had returned to his native city, where he painted his great 'Ecstasy of St Augustine' for the chapel of the Augustine monastery, a work spoiled by the changes insisted on by the monks, various subjects for the Célibataires, and the splendid 'Christ crucified between two Thieves' for the church of the Récollets at Mechlin, now in the cathedral there. It was about this period that he executed the fine series of *grisaille* portraits of eminent contemporaries which were published as engravings by Martin Vanden Enden, and with additions in 1641 by Giles Hendrix of Antwerp. In some twenty of these plates the painter himself etched the heads, and in their early states, before the line-work of the engravers has been added, these prints are greatly valued. The astonishing spirit, vigour, and expressiveness of the lines by means of which the features are rendered entitle Van Dyck to rank as one of the master etchers of the world.

In 1629 the painter again visited England, but he received little encouragement, and soon returned. We next find him at the Hague, painting the Prince of Orange and his family, Christian, Duke of Brunswick, and Count Ernest of Mansfeld; and in the spring of 1632 he again came to London, under the patronage of the Earl of Arundel, and was warmly received by Charles I., who had been impressed by his portrait of Lanière the musician, and had purchased his 'Armida and Rinaldo.' He was knighted by the king, appointed his principal painter in ordinary, installed at Blackfriars, and assigned a country residence in Eltham Palace; and in 1633 a pension of £200 was bestowed upon him, which, however, was very irregularly paid. One of his earliest works during this residence in England was the group of the king, queen, and two of their children, at Windsor; and during the next eight years he painted nearly every distinguished person connected with the court. About 1639 he married, through the influence of the king, Maria Ruthven, granddaughter of the first Earl of Gowrie. Leading a careless life and lavish in his pleasures, Van Dyck suffered from pecuniary straits; and frequently he found difficulty in obtaining payment for the royal commissions. He proposed to decorate the walls of the banqueting-room at Whitehall—the ceiling of which had been painted by Rubens—with a history of the order of the Garter, and prepared sketches of the subjects, but the work was never carried out. The greater part of 1634 and 1635 was spent in the Netherlands, when he painted Ferdinand of Austria, brother of Philip IV., now at Madrid, and many other portraits, and such religious subjects as 'The Adoration of the Shepherds,' in the church at Termonde, and 'The Deposition,' now in the Antwerp Museum; and at this time he was elected honorary president of the Antwerp Guild of St Luke. In 1640 he visited his native city for the last time, and then passed to Paris, hoping to be employed by Louis XIII. on the decoration of the Louvre; but here again he was unsuccessful, though he received other commissions. On his return to England he found that political troubles were distracting the country. His own health was now permanently broken, and he died in his house at Blackfriars, 9th December 1641, and was buried in Old St Paul's.

By universal consent Van Dyck is one of the most refined and graceful of painters. His portraits are full of expression, easy and natural in their attitudes, and the hands, in particular, are most elegant in form and pose. His religious subjects are distinguished by correctness of design, delicate blending of tones, and truth and purity of colouring. Most of the great English galleries, including the National Gallery, contain examples of Van Dyck's art, while Windsor Castle has an exceptionally rich collection.

See Smith's *Catalogue Raisonné of the Works of the most Eminent Dutch, Flemish, and French Painters;* William Hookham Carpenter's *Pictorial Notices, a Memoir of Sir Anthony Van Dyck, with a Catalogue of his Etchings* (Lond. 1844); Robert Dohme's *Kunst und Künstler*—'A. Van Dyck,' by Carl Lemcke in vol. i. (Leip. 1875); F. Wibiral's *L'Iconographie d'Antoine Van Dyck d'après les recherches de H. Weber* (Leip. 1877); P. R. Head, *Van Dyck and Hals* ('Great Artists' series, 1879); A. Michiel's *Van Dyck et ses Élèves* (Paris, 1881); J. Guiffrey's *Van Dyck, sa Vie et son Œuvre* (1882; trans. 1896); *Eaux-fortes de Van Dyck reproduites par Amand-Durand* (n.d.); Knackfuss (trans. 1899); Ernest Law, *Van Dyck's Pictures at Windsor Castle* (1899); and Lives by Cust (1900) and Stokes (1905).

Vane, SIR HENRY, was born at Hadlow, Kent, 26th May 1613. His father, 'old Sir Henry' (1589–1655), was a bustling and time-serving statesman, who rose to be principal secretary of state, but who, having, with his son, been a chief agent in Strafford's destruction, was six months later deprived of his offices, and sided thereafter with

the triumphant party. 'Young Sir Henry' in his 'fourteenth or fifteenth year was awakened from good-fellowship,' and at Magdalen Hall, Oxford, whither he passed from Westminster in 1628, appears to have embraced those republican principles for which he afterwards became so famous. His travels to Vienna and Geneva (1631) confirmed him in his aversion to the government and discipline of the Church of England; and in 1635 he sailed for New England—the refuge of disaffected spirits in those days. He was chosen governor of Massachusetts; but his advocacy of toleration, and bias to the Antinomian views of Anne Hutchinson (q.v.), soon robbed him of his popularity, and in 1637 he returned to England. He married in 1640 a daughter of Sir Christopher Wray of Ashby, Lincolnshire; in the same year entered parliament for Hull; and through his father's influence was made joint treasurer of the navy and knighted. Already, however, he had formed a close friendship with Pym and Hampden; and when the Civil War broke out no man was more conspicuous in the military and theological politics of the time than Vane. He relinquished the profits of his office (equivalent now to £30,000 per annum); he carried to the Upper House the articles of impeachment against Archbishop Laud; he was a 'great contriver and promoter of the Solemn League and Covenant' (though in his heart he abhorred both it and presbytery, and used them solely to attain his ends); with Cromwell he engineered the Self-denying Ordinance and the New Model (1644–45); and through the ten years 1643–53 'he was unmistakably the civil leader—that in the state, said his enemy Baxter, which Cromwell was in the field.' So, too, the sonnet by Milton. But he had no share in the execution of the king, and he did not view with satisfaction the growing power of Cromwell and the army. On the establishment of the Commonwealth he was appointed one of the Council of State; but it was largely Cromwell's dislike to his redistribution bill (1653) that prompted the dissolution of the Rump, when Vane's protest, 'This is not honest,' was met by Cromwell crying out with a loud voice, 'O Sir Henry Vane, Sir Henry Vane! the Lord deliver me from Sir Henry Vane.' Retiring to his Durham seat, Raby Castle, he there wrote his *Healing Question* (1656), whose hostility to the protectorate brought him four months' imprisonment in Carisbrooke Castle. On Cromwell's death he returned for a while to public life, but in the July following the Restoration was arrested and sent to the Tower. Thence he was shifted to the Scilly Islands, and thence brought back two years later to be tried for high-treason. Charles II. wrote to Clarendon, 'He is certainly too dangerous a man to let live, if we can honestly put him out of the way;' and on 14th June 1662 Vane was beheaded upon Tower Hill. Christopher, the youngest of his seven sons, was raised to the peerage by William III., and from him the Duke of Cleveland is descended. Vane's is a puzzling character, for he was a singular compound of a sane and far-seeing statesman, pure and high-minded withal, and of a fanatical and impracticable Fifth Monarchist. Rightly to comprehend him one should study his incomprehensible writings.

See the Lives by Sikes (1662), Upham (1835), Forster ('Statesmen of the Commonwealth,' 1840), Hosmer (1888), and Willcock (1913).

Vanessa; Vanhomrigh. See SWIFT.

Van Eyck. See EYCK.

Van Gogh. See GOGH (VINCENT VAN).

Vanilla, a genus of epiphytic Orchidaceæ, natives of tropical America and Asia. They are distinguished from most other orchids by their climbing habit; they cling with their aerial roots to the stems of trees or to rocks, attain the height of 20 or 30 feet, and obtain their chief sustenance from the atmosphere. There are about twenty species comprised in the genus. The flowers are thick, fleshy, and fragrant, but dull in colour. Vanilla is remarkable among orchids as possessing the only species of the family that have any economical value. From the fruit of several species the vanilla of commerce is obtained, the best being produced by the Mexican species, *V. planifolia*, which is now cultivated in many tropical countries. The fruit is cylindrical, about a span long, and less than half an inch thick. It is gathered before it is fully ripe, dried in the shade, and steeped in a fixed oil, generally that of the cashew nut. It contains within its tough pericarp a soft black pulp, in which many minute black seeds are imbedded. It has a strong, peculiar, agreeable odour, and a warm, sweetish taste. Benzoic acid is sometimes so abundant in it as to effloresce in fine needles. Vanilla is much used by perfumers, and also for flavouring chocolate, pastry, sweetmeats, ices, and liqueurs. Balsam of Peru is sometimes used as a substitute for it. When the fruit of vanilla is fully ripe a liquid (*Baume de Vanille*)

Vanilla planifolia, portion of stem with spike of flowers: *a*, a seed pod.

exudes from it. Vanilla has ripened its fruit in British hothouses, but the flowers are apt to fall off without fruit being produced, unless care is taken to secure it by artificial impregnation. This is, in some measure, the case even in India and in some parts of America itself, where the appropriate pollinating insects are wanting.—VANILLIN ($C_8H_8O_3$) is the aromatic principle of vanilla. It is also obtained from the Siam Benzoin (q.v.), asafœtida, pimento leaves, eugenol (a clove product), and other sources.

Vanini, LUCILIO, freethinker, was born at Taurisano in the Neapolitan territory in 1585, and at Naples and Padua studied the new learning of the Renaissance and the newer learning of physical science, qualified as *doctor utriusque juris*, and took orders as priest. But his 'naturalist'—anti-Christian and anti-religious—views soon brought him into collision with the church. Having taught in various parts of France, Switzerland, and the Low Countries, he had to flee from Lyons to England, where also he was imprisoned. At Genoa, Paris, and Toulouse he was constantly in trouble for his heresies, and at Toulouse he was arrested

and condemned first to have his tongue cut out, then to be strangled, and finally to be burned to ashes (19th February 1619). From his *Amphitheatrum Æternæ Providentiæ* (1615) and his *De Admirandis Naturæ Arcanis* (1616) it is plain that, if he was not an atheist, he taught pantheism of an extreme type; and he was more notable for vanity and audacity than for learning or speculative originality. But as an innovator he has many points in common with Bruno (q.v.). There are monographs by Fuhrmann (1800), Vaisse (1871), and Palumbo (1878). See John Owen's *Skeptics of the Italian Renaissance* (1893).

Vanloo, Jean Baptiste, a member of a family originally Flemish, in which a love of art seemed indigenous, was born at Aix in Provence in 1684. He painted successively at Nice, Toulon, and Aix, visited Genoa and Turin, and was sent by the Prince of Carignano, son-in-law of the Duke of Savoy, to study at Rome under Benedetto Luti. After a further residence at Turin, he proceeded in 1719 to Paris, and speedily acquired a great reputation as a portrait-painter. He was made a member of the Academy in 1731, and professor of Painting in 1735; visited London, where he painted Colley Cibber and Sir Robert Walpole; and died at Aix, 19th December 1745.—Charles André Vanloo, his younger brother, was born at Nice, 15th February 1705. He also studied at Rome under Benedetto Luti, and then settled in Paris, but later returned to Rome. At Turin he painted for the king of Sardinia a series of subjects illustrative of Tasso, after which he returned to Paris, and was appointed in 1735 a member of the Academy, and later a knight of the order of St Michael, and chief painter to the king. He died at Paris, 15th July 1765.

Vannes, a seaport town of France, capital of the dept. of Morbihan in Brittany, stands at the mouth of a tributary of the Gulf of Morbihan, 10 miles from the sea. The cathedral (13th to 15th cent., restored 18th century) is the most important edifice; but the town possesses also an old Maison du Parlement and many old carved houses, and a rich museum of Celtic antiquities. Manufactures of woollens and ropes and some shipbuilding are carried on; and the small port has some trade in agricultural produce, &c. Vannes dates from Roman times. In 1532 the union of Brittany and France was proclaimed here. Pop. (1921) 21,402.

Vannucci. See Perugino.

Van Rensselaer, Stephen (1765–1839), eighth 'patroon' of the vast estate near Albany, which was acquired by a Dutch ancestor early in the 17th century, and now forms three entire counties, was born in New York, was educated at Harvard, leader of the Federalists in his state, served in congress from 1823 to 1829, and for a while during the war of 1812 he held command on the northern frontier. He was a moving spirit in the construction of the Erie and Champlain Canals.

Vansittart, Nicholas (1766–1851), afterwards Lord Bexley, was the son of a governor of Bengal, and descendant of a family originally from Sittart in the Rhenish-Prussian principality of Jülich. He entered parliament as a Tory in 1796, and after holding a series of posts in successive ministries, in 1812 succeeded Mr Perceval as Chancellor of the Exchequer; and in 1823 he was raised to the peerage and made Chancellor of the Duchy of Lancaster. In 1810 he proposed (against Horner) the motion against resuming cash payments to the Bank of England; at the exchequer he left a large surplus.

Van't Hoff. See Hoff (van 't).

Van Veen, an occasional name for the meritorious Haarlem painter, Martin Jacobsz Heemskerk (1498–1574).—Otto van Veen was a native of Leyden, born *c.* 1556. He studied art at Liége and Rome, settled first at Brussels, next at Antwerp, where the great Rubens was his pupil. Van Veen stood high in the favour both of Parma and the next governor, the Archduke Albert of Austria. He died in Brussels about 1634.

Vapour. See Matter, Fluid, Gas, Steam.

Var, a dept. in the extreme south-east of France; area, 2333 sq.m.; pop. (1872) 293,757; (1921) 322,945; (1926) 347,932. The dept. receives its name from the river Var, which formerly served as its boundary on the east, but which, since the arrondissement of Grasse was taken from Var and added to the Alpes Maritimes, now belongs entirely to the latter. Var is well watered by a great number of streams, of which the chief are the Gapau, Argens, and Bianson. In the north and north-east it is mountainous, being traversed by the Monts de l'Esterel. Southwest of these are the Monts des Maures. Between the mountains and the watercourses are many very fertile valleys. The climate, tempered by the altitude of the surface, is pleasant. Fruits of all kinds are here cultivated with remarkable success; tobacco is grown, and much wine is produced. Silk-weaving, tanning, soap-making, and paper-making are the principal industries. The dept. abounds in minerals, and carries on an active commerce. It is divided into the three arrondissements of Draguignan, Brignoles, and Toulon. Capital, Draguignan.

Varallo Sesia, an Italian town in a beautiful valley amidst the foothills of the Pennine Alps, 35 miles NW. of Novara by rail; pop. 4000. Several of the churches contain works by Gaudenzio Ferrari. On the Sacro Monte above the town there is a famous Calvary; the path approaching it leads past 45 chapels, containing life-size terra-cotta groups with backgrounds painted by Ferrari. The pilgrimage church on the summit (1995 feet) was built by Pellegrino Tibaldi (after 1578).

Varangians. See Northmen, Russia, p. 845.

Varanidæ. See Monitor.

Varaždin, or Warasdín (Hung. *Varasd*), a Croatian town of Yugoslavia, formerly a royal free city of Hungary, on the river Drave, 28 miles NE. of Zágreb, with a cathedral. There are warm sulphurous springs 7 miles SW. Pop. 13,000.

Vardar, a river of Macedonia, rising in southwestern Yugoslavia, flows by Skoplje and Veles, enters Greece, and, after a course of some 200 miles, discharges by a delta into the Gulf of Salonika somewhat to the south-west of the town of Salonika.

Vardö, a small town on the narrow Norwegian island of Vardö, at the eastern extremity of Finmark (pop. 3000). Thousands of fishermen come in the spring to fish; whaling with harpoon-guns is busily carried on, and the carcasses are towed to Vardö to be boiled.

Varennes, a small town in the French dept. of Meuse, 18 miles NW. of Verdun, where Louis XVI. and his family were captured in the attempt to escape across the frontier, 22d June 1791. See book by O. Browning (1892).

Varese, a town of Northern Italy, at the end of Lake Varese (7 sq. m.), 18 miles by rail W. of Como, with delightful climate and surroundings. An old Roman and Lombard city, it has an old ducal palace, a church with a fine tower (246 feet), and manufactures of silk, &c. It is also a favourite summer and autumn resort of the Milanese. Pop. of commune (1921) 23,864.

Variation, in Music, a transformation of a melody by melodic, harmonic, contrapuntal, and rhythmic changes. The subject chosen is called

the theme; it is first simply harmonised with or without an introduction, and then repeated in a variety of different transformations, and the variations collectively with the theme constitute the piece; the whole terminates with an extended and richly developed variation, often fugal in character, or a coda. Early 16th and 17th century sets of variations set out primarily to offer a display of technical ingenuity both in the writing and in the playing, but Bach covered choral tunes with beautiful counterpoints. Beethoven, followed by Brahms, developed the rhythmic form of the theme rather than the actual melodic outline, while modern composers frequently take a theme of two contrasting (instead of two complementary) strains, and among the variations insert completely independent episodes.

Variation is the departure in any direction from some character which is regarded as typical. On the Darwinian Theory (q.v.) the occurrence of variation in the individuals of a species under nature is essential to natural selection, which proceeds by the elimination of those individuals that vary in such manner as to render them unsuited to the conditions of their existence.

That variation does occur in animals and plants is plain matter of fact. When large numbers of individuals are dealt with (1) the amount of departure—in some specific character—from the type can be measured or estimated, and (2) the percentage of variants which show this or that measure of departure can be tabulated. Variation is thus treated in accordance with statistical method (see STATISTICS).

In its application to Darwinian theory this plain-tale of variation is treated in its relation to Heredity (q.v.). Here variants of one generation are correlated with those of preceding or succeeding generations. One thus gets a further tabulation of relevant data when large numbers are statistically treated. It may be that the variants give a continuous series; or it may be that they exemplify discontinuous variation. In discontinuous variation there is a step or larger jump from one set of variants to the next. But in what is statistically a continuous series there is intergrading with no steps or jumps. This statistical continuity may, however, be masked discontinuity due to the averaging out of a great number of small steps superposed in the record.

On the basis of plain-tale observation of some given character, variation, whether discontinuous or statistically continuous, may be such as discloses direction. Under the Darwinian theory the arrow-head of direction in surviving variants points towards Adaptation (q.v.); and on this theory variants in the contrary or in some divergent direction are eliminated under natural selection. Hence, in palæontology for example, they escape the meshes of record. In other characters, however, there may be non-adaptive variation. Save in so far as these other characters are correlated with those that are adaptive or the reverse, they do not serve to determine whether the variant survives or is eliminated. One may say, then, that on the Darwinian theory, the adaptive direction of much variation is consequent on, and in this sense determined by, survival. On a different theory—orthogenetic for example (see EVOLUTION)—the direction of variation is in some way predetermined in such wise as to render it adaptive.

In terms of adaptation the question arises: Are all the variations observable in variants of successive generations in some measure inherited? Some biologists contend that they are. Others contend that only those which are germinal in origin are in some measure inherited, while those that are somatic in origin are not in any measure inherited. The vexed issue as to the inheritance of acquired characters, thus raised, is discussed under Heredity (q.v.). The difficulty is so to define the word 'acquired' that the question at issue shall be free from ambiguity.

Assuming (i.) that it can be so defined as to render probable the conclusion that, on the available evidence, acquired characters are not in any measure inherited; (ii.) that, on these grounds, there is a valid distinction between departures from type that are 'genetic in origin' and those that are 'somatic in origin'; and (iii.) that the word 'adaptive' is applicable to both; then some points that call for emphasis are (1) that the organisms which on the one hand survive and on the other hand are eliminated, are adaptively variant on both counts; (2) that it is only with the somatic expression of variation that the Darwinian theory is primarily concerned; (3) that the distinction between 'genetic in origin' and 'somatic in origin' goes beyond plain-tale, since it demands some further knowledge of what goes on within the organism hidden from the closest scrutiny of plain-tale observation; and (4) that the aim of statistical method under Biometrics is, by dealing with large numbers of variants assembled without initial bias, to discount individual idiosyncrasies.

Seeing that the recognised procedure of science is through resolute analysis to reach more adequate synthesis in the interpretation of nature, and seeing that analysis entails concentration of attention on what matters for the purpose in hand, it is legitimate in dealing with the origin of variation to disregard the fate of the variants in their natural environment, and hence in experimental work to take no account of adaptation. It is legitimate also to take somatic expression as given without entering further into the matter than to seek its source and origin. If the distinction between germinal and somatic in origin go beyond plain-tale and demand some further knowledge to the end of interpretation, it is legitimate to concentrate attention on the germinal factors, as deemed the main factors, and to deal with them in the light of that knowledge. And if, under statistical method in biometric treatment, individual idiosyncrasies so average out as to be masked, it is not only legitimate but imperative to submit the statistical results to more searching analysis. It is then found that closer scrutiny of detail discloses important features that treatment in mass does not reveal.

Subject to such precedent considerations as have been indicated, closer scrutiny of detail inaugurated a new departure in the study of variation in relation to a more sharply focussed concept of heredity. Nearly coincident with the beginning of this century the revival of Mendel's methods of observation marks a turning-point in the history of biology. In Mendelism (see HEREDITY) the observational incidence falls on what happens in the several members of a sequence of generations through mating under experimental control. What does happen is told elsewhere. Primarily it is told in plain-tale—just what any careful observer can describe. A tall pea and a dwarf pea are mated; the characters in this respect of all the offspring are duly noted. Further matings of individuals selected from among the members of this filial generation are arranged; the observable characters of their offspring are duly noted; and so on for successive filial generations, until the plain-tale is tellable and foretellable.

But plain-tale is supplemented by interpretation. Clearly fertilisation under experimental control is within the observable evidence. Here, therefore, in the gametes, is the starting-point for such interpretation as is outlined under Heredity (q.v).

The concepts which are expressed in terms of 'dominant' and 'recessive' are introduced. Much follows. Other observable traits in many strains of plants and animals are dealt with. Unit characters are distinguished. Factors in some way inherent in the gametes that unite to form the zygote are postulated. A hidden story in terms of these and other concepts, interpretative of the observable plain-tale, takes form. More complicated plain-tales, interpreted in terms of more complex and more refined concepts, are disclosed as the range of inquiry under the guidance of a ruling method is more widely and systematically extended.

Meanwhile, on grounds more and more distinctively cytological and physiological, this hidden story in terms of such concepts as factors, genes, and the like, is progressively correlated with a disclosable story in terms of Chromosomes (see CELL). A conceptual story of what presumably happens in plain-tale finds embodiment in a story of microscopically visible changes and interchanges in the life-threads of the gametes before and after their union to constitute the zygote. Thus through further correlation we have the physiological interpretation of the source and origin of variation, under heredity newly defined, that distinguishes modern Genetics.

In the plain-tale of variation under heredity the most one can do is to correlate somatic expression in this generation with somatic expression in precedent and subsequent generations. The aim of genetics is to show the manner in which this plain-tale may be interpreted in the light shed by modern research on all that happens in the gametes prior to, and consequent on, their union to form the zygote. The outcome, thus far, is to show that the chromosome constituents of the zygote are not other than those of the gametes, though not all the chromosome constituents of the gametes enter into the constitution of the zygote. The inference is that underlying the disconnected plain-tale of somatic expression in succeeding generations, there is hidden but disclosable structural connection in that living substance which is the abiding source of this expression.

The increasingly complicated conceptual interpretation under Mendelism, and its correlation in detail with chromosome changes and interchanges under genetics, invites and receives searching criticism. Much may require modification. Much remains that calls for further elucidation. The results of factorial and structural losses and recombinations are duly emphasised; but the emergence of that which is genuinely new in some of the characters expressed needs fuller recognition. Furthermore, the chromosomes are not physiologically isolated. They influence and are influenced by each other; they influence and are influenced by the cytoplasm of the cell; they influence and are influenced by the nutrient, and probably hormone-laden fluid, in which they are bathed; all this in ways which we are beginning —perhaps only beginning—to understand.

Is it matter for surprise that the accredited outcome of these newer methods of approach to the study of variation differs in some respects from that which forms a plank in the platform of the Darwinian theory? But should the old be abandoned as nowadays superseded by the new? Should we not rather say: In view of so much that is new the pressing need is for a fuller synthesis incorporating both old and new?

Throughout the world of organisms as they live under natural conditions, adaptation in bodily expression, including behaviour, still stares us in the face. Elimination and survival of variants are still in the logical and the biological picture. Statistical treatment under biometrics still reveals quite as much as it masks. It is fuller and more adequate synthesis that may be anticipated as the outcome of further investigation and inquiry. In the light of this synthesis will come the recognition of the value of old and new, each complementary to the other, within what A. N. Whitehead speaks of as an organic theory of nature.

For references, see ADAPTATION; BIOMETRICS; CELL; DARWINIAN THEORY; EUGENICS; EVOLUTION; GENETICS; HEREDITY; HYBRID; MENDEL; STATISTICS.

Varicose Veins. When a vein becomes dilated at a certain part of its course, for no apparent physiological object, such as relieving the venous circulation elsewhere (as, for example, in the case of the superficial abdominal veins enlarging in order to relieve a compressed vena cava), it is said to be varicose, the actual dilatation being called a *varix* (a word used in this sense by Cicero and Celsus). Some veins seem to be unaffected by varices, which, however, are of common occurrence in the sub-mucous veins of the rectum (constituting hæmorrhoids or Piles, q.v.), in the spermatic veins, giving rise to Varicocele, and in the veins of the lower extremities. They are occasionally (but very rarely) found in other veins. Certain conditions of the system favour the formation of varices, amongst which may be noticed an indolent temperament, and a debilitated condition of the general system, accompanied by a relaxed state of the walls of the veins; and possibly also a congenital predisposition or hereditary tendency. Persons with such a predisposition are more likely to suffer from this affection if their occupation is one which involves much standing or walking; and cooks, washerwomen, and foot-soldiers have been selected as specially prone to varicose veins. Varices may occur at almost any period of life, but are chiefly developed during middle age. Their formation is aided by any condition of the system which impedes the circulation, as certain diseases of the heart, lungs, and liver, and by continued *high living*, which is especially liable to induce hæmorrhoids. Direct pressure on the veins, e.g. by the use of garters, or by habitual constipation, is often an important factor in their production. From the researches of Andral, it appears that in varicose veins the coats of the dilated vessels may become thickened or may become thin; that they may be lengthened so that the veins become tortuous; and that the dilatation may be unequal, giving rise to the formation of pouches; and that, in consequence of the enlarged calibre of the vessels, the valves only act imperfectly, and gradually undergo degeneration.

Varicocele occurs as a tumour in the scrotum, most often on the left side, generally and aptly described as feeling under the fingers 'like a bag of worms.' It is rarely serious or painful, but often causes much anxiety and mental distress. The use of a well-fitting suspensory bandage and free bathing with cold water are generally efficient in keeping it in check; but it is often removed by operation, particularly when it prevents the patient's entrance into one of the public services.

Varices occurring in the leg, to which our remaining observations apply, commonly give rise to deep-seated aching pain in the limb, with a sense of weight, fullness, and numbness, before there is any external appearance of the affection. In a more advanced stage the ankles swell in the evening, and the feet are always cold. After a time a small swelling of a bluish tint appears, which disappears on pressure, but returns on the removal of the pressure, and is caused by a dilating vein. This dilatation extends, and forms knotty, irregular swellings, soft to the touch, diminishing on pressure or on the patient's assuming a horizontal posture,

and giving a bluish tint to the adjacent skin. These swellings commonly occur in the middle of the leg, along the track of the saphena veins, but they often extend along the whole of the leg and thigh. Amongst the troublesome consequences of varicose veins are the obstinate ulcers, known as varicose ulcers, to which they give rise; and it must be borne in mind that occasionally, when the skin gets thinned by prolonged pressure, the varices burst through it, and give rise to hæmorrhage, which, if not promptly stopped, may cause fainting, and even death. When such an accident occurs the patient should at once be placed in a horizontal position, and the leg raised, in which case the bleeding will probably cease. If it continue, a pad of lint must be pressed upon the mouth of the bleeding vessel by means of a few turns of a bandage round the limb.

Treatment must usually be palliative; pressure on the veins by garters, constipation, &c., must be removed; the general health must be attended to, liberal diet with tonics, or restricted diet with mild purgatives, being enjoined according to the patient's requirements. The weakened veins must be supported when the patient is going about by suitably regulated pressure; the application of a domett or india-rubber bandage every morning before rising is the most satisfactory method; but an elastic stocking is less trouble, and is more commonly used. The obliteration of one set of varices by operation is generally followed by the dilatation of adjacent veins. If, however, the varicose veins give rise to much discomfort, or prevent the healing of an ulcer, operation is often justifiable, and is followed by great relief. The operations employed may consist in ligature of the veins here and there, excision of considerable lengths, when they are dilated, &c.

Variegation, in plants, is a condition in which other colours are exhibited in parts where the normal colour should be green. Thus white, yellow, or other tints take the place of green in the leaves and other herbaceous parts. Yet variegation is regarded in botany as a disease, the causes of which are unknown. All that is yet determined respecting it is that it is invariably accompanied by a more or less complete suppression of the chlorophyll, the green granular matter which underlies the cuticle of the green parts of plants. Although often presenting similar peculiarities to chlorosis, another plant-disease, the cause of which is equally obscure, variegation is distinguished from it by the presence of chlorophyll in larger or smaller patches in the leaves, branches, or stems of the affected subjects. Variegation is usually a permanent characteristic, or may be made so by careful methods of propagation, and is compatible with vigorous health. These considerations give an importance to variegated plants in ornamental gardening which they would not otherwise possess. Variegated pelargoniums and many other bedding plants, perennial herbs and annuals, and some shrubs and trees derive their popularity as ornaments of the flower-garden from their variegation, which in many cases is so brilliant that it is substituted for flowers in the production of colour effects. Variegation is rarely perpetuated by seed; when it appears in a plant it can only be increased by means of cuttings, layers, division, or budding and grafting. In rare instances some tendency is shown in variegated plants to revert to the normal state; this is especially so in those that are grafted or budded. Inversely also the scion is found to exert influence upon the stock occasionally. Reversion to the original state is usually prevented by pruning away the first indications of it.

Vari'ola. See SMALLPOX.

Varley, JOHN (1778–1842), painter, born at Hackney, was one of the founders of the Society of Painters in Water-colours. He believed in astrology, and wrote on perspective design.—His brother CORNELIUS (1781–1873) was also a water-colourist, and invented the graphic telescope.—CROMWELL FLEETWOOD (died 1883), the son of Cornelius, was an F.R.S., and advanced telegraphy. See Story, *James Holmes and John Varley* (1895).

Varna, a seaport of Bulgaria, on the northern side of a semicircular bay, an inlet of the Black Sea, 115 miles SE. of Rustchuk by rail. Varna yielded to the Russians in 1828. The allied French and British troops were here encamped for some time in 1854, and occupied the town. The harbour was once exposed, but three breakwaters enclosing a sheltered basin have been built since 1895, and a considerable trade is carried on in grain, live-stock, and other products of northern Bulgaria, whilst there are regular steamer services to Constantinople, &c. The Congress of Berlin in 1878 decided that the strong fortifications by which the port was formerly defended should be destroyed, and the Bulgarians resolved to supply the loss by earthworks. The town is the seat of Greek and Bulgarian metropolitans. Pop. (1920) 50,810, including many Greeks and Turks.

Varnhagen von Ense, KARL AUGUST, German biographer, was born at Düsseldorf, 21st February 1785. He studied, first medicine, then philosophy, at Berlin and Halle, aided Chamisso in his *Musenalmanach*, joined the Austrian army and was severely wounded at Wagram, served as adjutant to Prince Bentheim, and in 1813 entered the Russian service, and became adjutant to Tettenborn, accompanying him to Paris. Here he was called to the Prussian diplomatic service, and accompanied Hardenberg to the Congress of Vienna (1814) and to Paris, becoming next resident minister at Carlsruhe. Recalled hence in 1819, he lived chiefly at Berlin thereafter, till his death, 10th October 1858. He had married in 1814 the charming Jewess, Rahel (q.v.). His chief works are critical biographies, written in graceful and polished style.

Of his many books may be named *Goethe in den Zeugnissen der Mitlebenden* (1823); *Biographische Denkmäler* (5 vols. 1824–30); *Denkwürdigkeiten und vermischte Schriften* (7 vols. 1843–46; vols. 8 and 9 ed. by his niece, Ludmilla Assing, 1859). His *Tagebücher* fill 14 vols. (1861–70); an edition of his *Ausgewählte Schriften* alone, 19 vols. (1871–77). His correspondence also has been published, with A. and W. von Humboldt, &c. See Life by Karl Misch (1926).

Varnish.—Ordinary varnish is a solution of a resin or gum resin in spirit or oil, which on being brushed or spread on a surface of wood or metal dries to an impervious film. The drying of varnish may be due to two causes; in the case of spirit varnish, the solvent being volatile, evaporates and leaves the resin as a film, whilst in the case of an oil varnish the oil absorbs oxygen from the air, forming a solid mass, the film in this case being composed of the hardened oil and the resinous film. The film from the spirit or any quick-drying varnish is inclined to be brittle, but in the case of an oil varnish this brittleness is overcome by the more elastic hardened oil. Some of the newer varnishes consist of esters of cellulose dissolved in organic volatile liquids; on evaporation of the solvent they leave a thin but hard coating of cellulose. They are much used for coach and motor-body work.

The gums and resins used in varnish making are mainly shellac, sandarac, copal, mastic, and dammar. These are all naturally occurring substances; more recently artificial resins, made by

condensing phenols with formaldehyde, are coming into use. The oils used in the manufacture are linseed, walnut, poppy, and tong; the last named is only used for special varnishes. In the manufacture of oil varnish the gums and resins are first fused—this treatment renders them more soluble; they are then dissolved in the hot oil, sometimes with the addition of lead and manganese compounds to act as driers. The temperature has to be carefully watched during this stage; after solution is complete the liquid is allowed to cool down and then turpentine is added; the liquid is now run into tanks to settle. The actual details of the proportions of the ingredients used and the temperatures maintained are carefully guarded trade secrets.

Cheap copal varnish is often innocent of copal, the cheaper kauri gum taking its place. The manufacture of spirit varnish is a much less complicated process; it is a case of simple solution at the ordinary temperature, the varnish being allowed to clear by sedimentation. The varnish used by French polishers is a solution of shellac in alcohol; artists' and map varnish is usually made from copal. In japanning, the varnished article, after drying, is heated so as to fuse the film of resin (see JAPANNING).

The cellulose varnishes are usually made from the nitrate or acetate of cellulose dissolved in either amyl acetate, butyl acetate, or ethyl acetate. As the film left from such a solution lacks elasticity and adhesiveness it is necessary to add camphor or castor oil. There is also added a non-solvent liquid such as benzol or methylated spirit; these, however, must be used cautiously, as they are liable to cause the precipitation of the cellulose as an amorphous mass. These varnishes cannot be applied with a brush: they are sprayed by a special spraying apparatus.

Lacquer is a varnish derived from the milky juice of certain trees. Japanese lacquer is prepared from the *Rhus vernicifera;* Chinese lacquer is probably derived from the same tree. Exposed to air and sunlight the milky juice becomes a brown oily liquid; some pigment is then added, and the varnish is ready for use. The celebrated Ningpo varnish is said to be made from tong oil and blood.

Varnish Tree, a name given to trees belonging to several distinct families, the resinous juice of which is used for varnishing or for lacquering: the Black Varnish Tree, *Melanorrhœa usitata* (Anacardiaceæ); the Japan Varnish Tree, *Rhus vernicifera* (Anacardiaceæ); the New Granada Varnish Tree, *Elœagia utilis* (Cinchonaceæ); and the Sylhet Varnish Tree, *Semecarpus Anacardium* (Anacardiaceæ).

Varro, MARCUS TERENTIUS, the most learned of the Romans, was born probably of equestrian rank in the Sabine town of Reate, 116 B.C. He studied under L. Ælius Stilo, and at Athens under Antiochus of Ascalon, whose philosophy Cicero makes him expound as an interlocutor in the *Posterior Academics.* He saw some service under Pompey, and in the civil war was legate in Spain with Petreius and Afranius. He awaited the result of Pharsalia with Cicero and Cato at Dyrrachium, and was kindly treated by the conqueror, who appointed him to be librarian for his intended collection. The second triumvirate plunged him into danger, and Antony plundered his splendid Casine villa, burned his beloved books, and placed his name in the list of the proscribed. But he was soon exempted, and Augustus even restored his property, so that he was able to spend his latest years in peace. He survived till 27 B.C. Varro was a man of upright and honourable character, a monument of the old-fashioned Roman virtues, even to their hard and unsympathetic side. His diction shows qualities of the same kind—it is pithy and vigorous, but harsh, abrupt, without flexibility or charm. The total number of his works amounted to about 620 'books,' belonging to seventy-four different works. Of the poetical works (*saturæ, pseudo-tragœdiæ,* and *poemata*) we know nothing but the names. But of the 150 books of the *Saturæ Menippeæ,* a medley of prose and verse, imitated from the Cynic satirist Menippus (q.v.), enough fragments (ed. Riese, 1865; Bücheler, 1882) remain to prove the greatness of the loss. Here we find in singular medley grotesque personifications of ideas, ridicule of the philosophers, mythology, erudition, proverbs, bitter satire at the social corruptions of the day, and praise of the homely virtues of the good old times, the whole spirited and rich in humour, if seldom artistic in form. Varro's prose writings embraced oratory, history both general and literary, jurisprudence, grammar, philosophy, geography, and husbandry. The most important of these were his *Antiquitates Rerum Humanarum et Divinarum,* a work of vast learning in forty-one books, a mine in which burrowed Pliny, Plutarch, Gellius, Festus, Macrobius, as well as the Christian fathers, especially St Augustine; *De Lingua Latina,* in twenty-five books, of which v.–x. are extant (ed. by C. O. Müller, 1833, and by Spengel, 1885), marred by arbitrary arrangement, and etymologies due to mere empirical word-play; *Rerum Rusticarum Libri III.,* almost entire (ed. Keil, 1884; well translated by Lloyd Storr-Best, 1912), in dialogue form, on agriculture, cattle, bird- and fish-breeding. His *Disciplinarum Libri IX.* deserved to live, being an attempt at an encyclopædia of the liberal arts; his *Imaginum Libri XV.,* or *Hebdomades,* was a series of 700 illustrated biographies of Greek and Roman celebrities with a metrical eulogium on each. See Ritschl's *Opuscula* (vol. iii.).

Varro, PUBLIUS TERENTIUS, distinguished from the foregoing as Atacinus from his birth at Atax in Narbonensian Gaul about 82 B.C., wrote an epic on Cæsar's wars in Gaul (*Bellum Sequanicum*), and satires at which Horace scoffs, while Quintilian characterises him as 'interpres operis alieni.' His *Argonautica,* a free adaptation of Apollonius Rhodius, delighted Ovid and Statius; his erotic elegies pleased Propertius. He died 37 B.C.

Varuṇa (akin to Gr. *Ouranos*), an ancient Indian Vedic god of heaven and day; in the *Rigveda* he is regarded as a moral deity who watches over men and punishes them for sin, but who is prepared to forgive those who are contrite of heart. This aspect of his character later is obscured, and he yields pride of place to Indra, becoming mainly a god of the waters, a relic of his former greatness as sky god. It has often been suggested that his moral grandeur in the *Rigveda* is due to Semitic influence, but for this theory there is no foundation.

Varus, PUBLIUS QUINTILIUS, was consul in 13 B.C., next governor of Syria, and about 7 A.D. was sent by Augustus to command the armies of Germany, and form that country into a Roman province. For the story of his disaster, see ARMINIUS. Varus killed himself in despair.

Varzin, a Pomeranian village, 25 miles SE. of Köslin, notable as having near it the castle and park of Prince Bismarck.

Vasa. See VAASA.

Vasa. See GUSTAVUS VASA, SWEDEN, p. 805; also POLAND, p. 257. The family had for its armorial bearings, a bundle of yarn (*vasa*).

Vásárhely. See MAROS-VÁSÁRHELY.—Hódmezö-Vásárhely, a Hungarian town 20 miles NE. of Szegedin by rail, with great cattle-markets, and varied industry. Pop. (1920) 60,922.

Vasari, GIORGIO, an Italian architect and painter, famous as a biographer and critic of artists, was born at Arezzo, 30th July 1511. He was a pupil of Michelangelo, and obtained the patronage of many distinguished persons, as Cardinal Ippolito de' Medici, Clement VII., and the Dukes Alessandro and Cosmo de' Medici; but his pictures (many of which still exist, as in the Palazzo Vecchio, Florence) possess no distinctive merit. His reputation rests exclusively on his *Vite de' più eccellenti Pittori, Scultori, e Architetti* (1550; standard edition by Milanesi, 9 vols. 1878–85; trans. by Mrs Foster, 1850, G. de Vere, 10 vols. 1912–16, and in part by Blashfield and Hopkins, 1897). The work, which remains a classic, is eminently entertaining and the criticism is often admirable, in spite of attributions no longer accepted and frequent inaccuracies in the early biographies. Vasari died at Florence, 27th June 1574. See his autobiography in the *Lives*, and Life by Carden (1910).

Vasco da Gama. See GAMA.

Vascular Bundles. See WOOD, STEM, LEAF, ROOT.

Vase (Fr. *vase;* Lat. *vas,* 'a vessel'), a hollow vessel, usually decorated and decorative; modern vases being solely ornamental. Ancient vases were made of metal, stone, glass, or earthenware. Historically interest attaches chiefly to vases of glass and earthenware; and such vases —Egyptian, Cretan, Phœnician, Greek, Etruscan, Roman, Chinese, Japanese, and modern European —are discussed, with illustrations, at GLASS and POTTERY. See also PORTLAND VASE.

Vaseline is a name applied to a substance obtained from the less volatile residue of petroleum, and is a trade-mark belonging to one special manufacturer. Yellowish, translucent, and crystalline in appearance, it is nearly of the consistency of soft soap, and is almost perfectly tasteless and inodorous. It is soluble in ether, and resists the action of most chemicals. Largely used as a salve or liniment, it is also made the base of various ointments and pomades; and it may be employed inwardly as a remedy in colds, coughs, and hoarseness. It is an excellent lubricant; is serviceable for protecting polished steel or iron from rust; and has the advantage over animal and vegetable fats that it does not become rancid. The substance is known in commerce under a host of fancy names, while it appears in the pharmacopœia as *Paraffinum molle.*

Vasishtha. See VEDA.

Vassal. See FEUDALISM.

Vassar College, opened in 1865 for the higher education of women, lies to the east of Poughkeepsie, New York, in grounds extending to 210 acres—the gift, along with $800,000, of the founder, Matthew Vassar (1792–1868), who came a child from Norfolk, and died a wealthy brewer at Poughkeepsie. It has about 150 instructors and over 1000 students, and there are a museum, an observatory, a laboratory, and a library of 70,000 volumes. See works by Lossing (1867), Raymond (1873), and Frances A. Wood (1909).

Vasto (anc. *Histonium*), a town of Southern Italy, on the Adriatic, 70 miles NW. of Foggia, with a small harbour, fisheries, olive-gardens, &c. It is still surrounded by walls, and there are some interesting buildings. Pop. of commune (1921) 14,366.

Vateria. See ANIMÉ, TALLOW-TREE.

Vathy. See SAMOS.

Vatican. See ROME, p. 767. For the Vatican MS. of the New Testament, see CODEX.

Vatican Council, which proclaimed the Infallibility (q.v.) of the Pope, met under the auspices of Pius IX. (q.v.) on the 8th December 1869, and was adjourned (but not dissolved, so that it might still reassemble) 18th July 1870. It is variously reckoned the 19th, 20th, or 21st of the Œcumenical Councils (see COUNCIL), and was attended by the largest number of ecclesiastics ever assembled at a council—by 764 out of 1037 entitled to attend. Of those present 276 were Italians. After the outbreak of the Franco-German war the attendance sank to about 200. In the end Ultramontanism triumphed over the opposition of liberal bishops like Hefele and Strossmayer. The œcumenicity of the Council was denied by the Old Catholics (q.v.).

See the history by Cecconi (1873); Gladstone's *Vatican Decrees* (1874) and *Vaticanism* (1875), Manning's *True Story of the Vatican Council* (1877), and other controversial pamphlets; German works by Fessler (Catholic), Friedrich and Döllinger (Old Catholic), and Friedberg (Protestant); and the *Acta et Decreta* (new ed. 1892).

Vatke, WILHELM, theologian, born at Behndorf near Magdeburg, 14th March 1806, habilitated at Berlin as *privat-docent* in theology in 1830, was appointed professor extra-ordinary in 1837, and died 18th April 1882. His works were *Die Religion des Alten Testaments* (1835), *Die menschliche Freiheit* (1841), *Historischkritische Einleitung in das Alte Testament* (1886) and *Religionsphilosophie* (1888). He grasped the idea of the post-Exilic origin of the Priestly Code in the Pentateuch (q.v.) as early as Graf, but the names of both have paled before those of Kuenen and Wellhausen.

Vatnajökull. See ICELAND.

Vattel, EMÉRIC DE, writer on the law of nations, was born at Couret, in Neufchâtel (then Prussian), 25th August 1714. Trained for the church, he entered the diplomatic service of Saxony, and from 1746 till 1764 was Saxon representative at Bern. Here he published several works, but became known for his *Droit des Gens* (1758), which contained little that was new, but abridged and systematised the doctrines of Grotius, Puffendorf, and Wolf. It was often edited and translated, and had a greater vogue than it deserved. Vattel died 28th December 1767.

Vauban, SÉBASTIEN LE PRESTRE DE, military engineer and marshal of France, was born at Saint Léger du Fougeret, near Avallon in Burgundy, 15th May 1633. Left a destitute orphan at ten, he was brought up by the village *curé,* and at seventeen enlisted in the regiment of Condé, then in league with Spain against the king. Taken prisoner in 1653, he was persuaded by Mazarin to take service under the king, and in 1655 he received his commission as one of the royal engineers. Already in 1658 he had the chief direction of the attacks made by Turenne's army, and the eight years of peace that followed this campaign he devoted to works at Dunkirk and elsewhere. In 1667 he helped to reduce Lille, and next was appointed governor of its new citadel. During the campaigns in the Low Countries (1672–78) he took part in seventeen sieges and one defence, rising to be brigadier and major-general, and at the close commissary-general of fortifications. He first introduced the method of approach by parallels at the siege of Maestricht (1673), and with such effect that that strong fortress capitulated in thirteen days. The rest of his more famous exploits in these campaigns were the triumphant defence of Oudenarde and the sieges of Valenciennes and Cambrai. During the ten years of peace which followed 1678 Vauban rendered to France perhaps the greatest of his services, in surrounding the kingdom with a complete cordon

of fortresses (for his system, see FORTIFICATION); and he planned and partly executed the magnificent aqueduct of Maintenon, by which the waters of the Eure are conveyed to Versailles. In 1703 he rose to be marshal of France.

War breaking out again in 1688, Vauban conducted with his usual success the sieges of Philipsburg—introducing here his invention of ricochet-batteries—Mannheim, Mons (1691), and Namur (1692). The sieges of Charleroi (1693), Ath (1697), Breisach (1704), and the construction of the entrenched camp near Dunkirk (1706) are the only professional works of importance during the last fourteen years of his life. After the peace of Ryswick in 1697 he had applied his active mind to the consideration of various faults in the internal government of France, and he had observed the fatal consequences of the Revocation of 1685. His ideas he submitted in a memoir to Louvois and Madame de Maintenon in 1686. But another work, the *Dîme Royale* (1707), in which he discussed the question of taxation, and anticipated in the most striking manner the doctrines which eighty years later overthrew the French monarchy, brought down a heavier storm upon his head. Saint-Simon tells us the book was clear, simple, and exact, but the truths it told were unpalatably plain. In 1699 and again in 1704 he had sent it to the king, but no notice was taken till in 1706 he began privately to print 300 copies, whereupon the book was at once condemned. Vauban did not long survive his disgrace, dying at Paris, March 30, 1707. 'I have lost a man very devoted to my person and to the state,' said his self-complacent master. His body was buried at Bazoches; in 1806 Napoleon deposited his heart in the Invalides.

Saint-Simon describes Vauban as 'perhaps the most honest and most virtuous man of his age . . . never was man more gentle, more kindly, or more obliging.' Of middle height, hardy frame, blunt manners, sound judgment, and indomitable courage, he never experienced a reverse, yet all his success never turned his head nor impaired his modesty. He conducted fifty successful sieges, and designed or improved the works of more than 160 fortresses, among them Dunkirk, Landau, Lille, and Strasburg. He it was, and not Mackay, who in 1687 invented the socket instead of the plug bayonet.

In 1669 he wrote in six weeks for Louvois his *Mémoire pour servir d'Instruction dans la Conduite des Siéges*, published at Leyden in 1740. A selection of his MSS. formed the *Oisivetés de M. de Vauban* (4 vols. 1843–46). *Lettres intimes inédites* appeared in 1924. See Chambray, *Notice historique sur Vauban* (1840); Michel, *Histoire de Vauban* (1879); Ambert, *Le Maréchal de Vauban* (1882); Daniel Halévy, *Vauban* (1923, trans. 1924); also Major E. M. Lloyd's *Vauban, Montalembert, Carnot: Engineer Studies* (1887).

Vaucluse, a department in the SE. of France, bounded on the west by the Rhone, and on the south separated by the Durance from Bouches du Rhône. Area, 1381 sq. m.; pop. (1872) 263,415; (1921) 219,602; (1926) 230,549. The east is intersected by spurs of the Alps; in the west are plains. Agriculture is the chief occupation; there are distilleries, tanneries, foundries, potteries, while silk and wool weaving, glass-making are carried on, and chemicals are manufactured. Originally composed of the county of Venaissin, the principality of Orange, and part of Provence, the department is divided into the arrondissements of Apt, Avignon, Carpentras, and Orange, Avignon being the capital.—The village of Vaucluse (*Vallis clausa*) stands in a romantic ravine 19 miles E. of Avignon, and is noted as having been for sixteen years the residence of Petrarch, and for its famous fountain.

Vaud (Ger. *Waadt*), a canton which forms the western corner of Switzerland, reaching from the Jura to the Bernese Alps. Area, 1244 sq. m.; pop. (1920) 317,498. It is a comparatively level district, traversed, however, by an elevated tract known as Mont Jorat, from which plains slope on either side, to the Lake of Geneva on the south and the Lake of Neufchâtel on the north. On both sides, near the mountains, there are extensive pasture-lands, but the greater part of the country is highly cultivated. The vineyards yield white wines of excellent quality. Vaud forms part of French Switzerland; the religion is Protestant. After the fall of the Roman empire it belonged to the Burgundian kingdom, but in the 13th century it became a dependency of Savoy, and in 1536 the Bernese took possession of it. The French invasion put an end to the rule of Bern, and Vaud became a separate canton in 1798. The existing constitution dates from 1845 (see SWITZERLAND). Lausanne is the capital. See WALDENSES.

Vaudeville, originally a popular song with words relating to some story of the day; whence it has come to signify a play in which dialogue is interspersed with dances and songs of this description, incidentally introduced, but forming an important part of the drama. It is usually comic. The name Vaudeville is a corruption of Val de Vire, the name of a picturesque valley in the Bocage of Normandy. One Olivier Basselin, a fuller in Vire, composed about the middle of the 15th century a number of humorous and more or less satirical drinking-songs, which were very popular, and spread over France, bearing the name of their native place (Vaux de Vire).

Vaudois. See WALDENSES.

Vaudoux. See NEGROES.

Vaughan, CHARLES JOHN, was born at St Martin's vicarage, Leicester, in 1816, and had his education under Arnold at Rugby, and at Trinity College, Cambridge, graduating senior classic (bracketed with Lord Lyttelton) and chancellor's medallist in 1838. Elected next year to a fellowship in his college, he was successively vicar of St Martin's, Leicester (1841–44), head-master of Harrow (1844–59), vicar of Doncaster (1860–69), Master of the Temple (1869–94), and Dean of Llandaff (1879). Already in 1860 he had declined the bishopric of Rochester; in 1882 he was made a Clerk of the Closet to the Queen. He died 15th October 1897. An eloquent preacher of the liberal evangelical school, he published *Harrow, Temple*, and *University Sermons;* Lectures on Acts, Revelation, Philippians; editions of Romans, Philippians, Hebrews; *Family Prayers, Discourses on Liturgy and Worship, Addresses to Young Clergymen, On Some Ministerial Duties, The School of Life*, &c.

Vaughan, HENRY, poet, styled 'the Silurist' from his having been born among the Silures of South Wales, was descended from an ancient family, and was born in 1622 at Newton, near Skethiog, in the parish of Llansaintfraed, Brecknockshire, twin-brother of the alchemist Thomas Vaughan (1622–65). He entered Jesus College, Oxford, in 1638, and shared the loyalty of his family, although apparently he did not actually bear arms in the cause. Early a devoted admirer of Ben Jonson, Randolph, and other poets of the day, in 1646 he published at London his first *Poems, with the tenth Satyre of Juvenal Englished.* He now studied medicine, became M.D., and retired to practise first at, and then near, Brecon. The collection of poems entitled *Olor Iscanus* ('Swan of the Usk') was sent to his brother at Oxford, and was published by him without authority in 1651. About this time a long and

dangerous illness deepened his religious convictions, and henceforward the themes of all his verse are the littleness of time and the greatness of eternity, the sinfulness of sin, the death and saving grace of Christ. In 1650 he printed at London his *Silex Scintillans* ('Sparks from the Flintstone'), a collection of pious meditations after the model of Herbert (second part printed with it in 1655), and followed it up in 1652 with *The Mount of Olives*, a little book of devotions in prose, and the *Flores Solitudinis*, also in prose. Not till the year 1678 was another collection of his verses published, and this time again by a zealous Oxford friend ('J. W.') without his concurrence. This was the *Thalia Rediviva; the pastimes and diversions of a Country Muse*, a collection of elegies, translations, &c. of all periods of his life, closing with a few religious pieces (*Pious Thoughts and Ejaculations*), and a pastoral elegy on the death of his brother Thomas. Of the rest of his life we know nothing save that it wore itself away in the labour of his profession and in a quiet walk with God in his beloved vale of Usk. He died April 23, 1695. Vaughan's poetry is very unequal—his vein seems to have been a *flinty* soil, from which the right Promethean fire could be struck but now and then. At his best he reaches an exquisiteness of phantasy and of expression beyond the reach of Herbert, but by far the larger part of his poetry, and indeed of almost every poem, sinks below that more popular poet's usual level. 'The Retreat,' 'Childhood,' and especially 'Departed Friends' are some of the rarest flowers in the whole garden of our sacred verse, and atone for much uncouthness, obscurity, and prose. The first of these has been claimed as the prototype of Wordsworth's greater *Ode*, and it certainly supplies a dim hint of its fundamental thought. Vaughan's poetry is essentially mystical and contemplative, at times obscure, but some of his elegies are very beautiful.

There are complete editions by Grosart (4 vols. 1868–71) and by Martin (1915), and of the poems by E. K. Chambers (1896) and E. Hutton (1904). The sacred poems were published by Lyte in 1847 (repr. 1858). See Dr John Brown's *Horæ Subsecivæ*, Palgrave's paper in *Cymmrodorion* (1891), Miss Guiney's *English Gallery* (1894), and Edmund Blunden, *On the Poems of Henry Vaughan* (1927).

Vaughan, HERBERT, Roman Catholic archbishop of Westminster, was born at Gloucester on 15th April 1832, the eldest son of Lieut.-colonel Vaughan, of Courtfield, near Ross. Educated at Stonyhurst and on the Continent, he entered the priesthood, and in 1872 was consecrated Bishop of Salford, in 1892 succeeded Cardinal Manning as Archbishop of Westminster, himself shortly after being raised to the cardinalate. Founder of St Joseph's College for foreign missions at Mill Hill, Hendon, and proprietor of the *Tablet* and the *Dublin Review*, he died 19th June 1903. See Life by Snead-Cox (1910).—His brother, ROGER WILLIAM BEDE VAUGHAN (1834–83), Archbishop of Sydney from 1877, wrote a Life of Thomas Aquinas (1871–72).—Another brother, BERNARD VAUGHAN (1847–1922), was a fashionable preacher on the sins of society.

Vaughan, ROBERT (1795–1868), was in turn Independent minister at Worcester, Kensington, professor of History in the university of London, and president of the Lancashire Independent College, Manchester (1843–57). After his retirement he preached at Uxbridge, St John's Wood, and Torquay. He founded the *British Quarterly Review* in 1845, and edited it for twenty years, and was chairman of the Congregational Union in 1846.

Among his many books may here be named *Life of Wycliffe* (1828), *Causes of the Corruption of Christianity History of England under the House of Stuart* (1840), and *Revolutions in History* (3 vols. 1859–63).

Vaughan Williams, RALPH, composer, was born at Down Ampney near Cirencester, 12th October 1872, was educated at Charterhouse and Cambridge, studied music at the Royal College, London, also under Max Bruch, and under Ravel. His principal works are *Toward the Unknown Region* (1907) and *Sea Symphony* (1910), both for chorus and orchestra, the texts taken from Walt Whitman; two orchestral symphonies, *London* (1914, rev. 1920) and *Pastoral* (1922); an unaccompanied *Mass* (1920); a ballad opera, *Hugh the Drover* (first performed 1924); some orchestral music, and many beautiful songs, including settings of lyrics by George Herbert, A. E. Housman, R. L. Stevenson, and D. G. Rossetti. Vaughan Williams has also collected and published a large number of English folk-songs, which have very powerfully influenced his own compositions with their strong melodic lines and frequent modal style of writing. His art is direct, dealing only with essentials, while he has a fine command over the resources of counterpoint, developing, 'planar' harmonisation, whereby blocks or planes of harmony are treated as single parts and combined, regardless of how the chords collide.

Vault, an arched roof, usually constructed of stone or brickwork. See GOTHIC ARCHITECTURE.

Vauvenargues, LUC DE CLAPIERS, MARQUIS DE, a French writer of *Pensées*, born at Aix, near Marseilles, 6th August 1715, of ancient but impoverished provincial nobility, entered the army as lieutenant in the Régiment du Roi, 1733, and became known for his simple life and studious habits. In 1737 he wrote a treatise on *Free-will*, and began a correspondence with his cousin, the Marquis de Mirabeau—otherwise known as 'the Friend of Man.' Vauvenargues' health suffered from the hardships of campaigning, and in 1743 he left the service after bearing part in the defeat of Dettingen. With health and means hopelessly impaired, he retired to his native place, having vainly sought for diplomatic employment. In 1744 his health was further shaken by an attack of smallpox; on recovering he resolved to settle in Paris, where he became intimate with Marmontel and his set. The conditions of such a life, always embarrassed by bad health, did not allow of a high level of literary attainment. He obtained, however, the good opinion of still more important literary men, especially by a comparison between Corneille and Racine which he sent to Voltaire. In 1746 he published his *Introduction à la Connaissance de l'Esprit Humain*, with *Réflexions et Maximes* appended. The work was anonymous, but obtained commendation from Voltaire, who said that 'he knew of no book better suited to form a well-born, well-trained spirit.' Next year the author died. Vauvenargues never mastered the languages of Greece and Rome; never even formed a mature taste in the literature of his own country. Yet his 'Greek style' and 'neat justice' have been praised by Sainte-Beuve; and the 'Advice to a Young Man' which closes the *Réflexions* is a fine piece, full of noble character and subtle thought. Vauvenargues was pious, though liberal; and Voltaire continued to praise him after death had prematurely arrested his career. Less pungent than his prototype La Rochefoucauld, Vauvenargues seems to have gained upon him in the favour of posterity: he is an instance of the power of sympathy: and his goodness is a source of strength and even of a certain sort of greatness. Often trivial and bald, sometimes reaching only a truism or a shallow paradox, he yet arrests the attention of his reader, and endears himself to his heart. Close observation, suggestive, if hardly

profound thought, insight into the fundamental conditions of morality have proved less effectual to this end than his inherent goodness of heart. His literary fortune is illustrated by his own saying: 'Les maximes des hommes décèlent leurs cœurs.'

The chief editions are by Gilbert (2 vols. 1857) and Plon (3 vols. 1874). See Sainte-Beuve, *Causeries du Lundi*, vols. iii., xiv.; the study by Paléologue (1890); Miss Lee's *La Bruyère and Vauvenargues* (1903); and Gosse's *Three French Moralists* (1918).

Vauxhall, a public garden in London, opened immediately after the Restoration (May 1660), and closed on 25th July 1859, the site being sold for building purposes. It was situated in Lambeth, opposite Millbank, and near the manor called Fulke's Hall (the residence of Falkes de Breauté, a follower of King John), from which is derived its name. Pepys, writing May 28, 1667, describes the garden and its entertainments as 'mighty devertising.' But the eating, drinking, dancing, and flirtation that continually went on there led also to much quarrelling and dissipation. The loose character of the amusements it afforded is freely sketched by the dramatists and novelists of the 18th century, and is again revived in Thackeray's *Vanity Fair*. In 1823 the total number of visitors was 133,279, and on the one night of 2d August 1833, 20,137 (both maximum figures).

Vavasour, or VALVASSOR, a term of feudal times, more in use in the continent of Europe than in England, employed somewhat loosely, and defined by Camden as the rank next below a baron. Its usual meaning was one who held his lands, not directly of the crown, but of one of the higher nobility. See FEUDALISM.

Vazov, IVAN (1850–1921), the most conspicuous figure in modern Bulgarian literature, became known in the days of the Turkish oppression for his spirited patriotic lyrics, and added to his reputation in revolutionary days by such pieces as *The Flag and the Psaltery*, *The Sorrows of Bulgaria*, &c., and during the World War by *Under the Thunder of Victory*, *Songs of Macedonia*, &c. *Under the Yoke*, the best of his novels, was written in exile in Russia and has been translated into English (1894) and other languages. His plays are not of great merit.

Vecellio. See TITIAN.

Vector, in Mathematics, is any directed straight line of definite length. It is conceived of most simply as a carrying or transference or step from any chosen point to that other point lying in the proper direction and at the proper distance. Take any three points ABC. Then it is evident that the operation of passing from A to C is equivalent to the successive operations of passing from A to B, and then from B to C. In other words, the *vector* AC is equal to the sum of the *vectors* AB and BC. Of course if we limit our consideration to lengths only this theorem does not hold. It is easy to see that two vectors cannot be equal unless they have the same length and the same direction. The opposite sides of a parallelogram are equal vectors. On the other hand, the radii of a sphere, although they are all of the same length, are different vectors. The fundamental law of vector addition, which has been given above, is illustrated by the law of combination of a great many important physical quantities, such as velocity, force, rotation, couple, and so on. These can all be represented by directed straight lines, and are called vector quantities (see COMPOSITION). Laws for the multiplication and division of vectors have been given by Hamilton (see QUATERNIONS) and partly by Grassmann.

For a discussion of the chief properties of vectors, see Maxwell's *Matter and Motion*, Clifford's *Kinematic*, Kelland and Tait's *Quaternions*.

Veda (from the root *vid*, 'to know,' hence 'knowledge,' '(sacred) science') is the name of a body of religious doctrine which the Hindus believe to exist eternally, being made known to mankind by inspired seers (*ṛishi*) whose mental eye is sufficiently keen to discern it. This body primarily consists of four collections (*saṃhitâ*) of hymns, detached verses, and sacrificial formulas—viz. the *Ṛigveda*, or Veda of praises or hymns; the *Sâmaveda*, or Veda of chants or tunes; the *Yajurveda*, or Veda of prayers; and the *Atharvaveda*, or Veda of the Atharvans—to each of which are attached certain theological prose-works, called Brâhmaṇa, intended chiefly to elucidate the meaning and application of the sacred texts, especially from a sacrificial point of view. The first three Vedas are often referred to as the *trayî vidyâ*, or threefold science; and they alone must originally have formed the sacred canon, whilst the fourth Veda, which is less archaic in metre and language, and which is essentially a handbook of magic rites for public and domestic use, was not recognised till a later period. The Saṃhitâs of the *Sâmaveda* and *Yajurveda* are of a purely sacrificial and professional character, being intended to serve as text-books for two of the four chief classes of priests—viz. the chanters (Udgâtar) and the offering priests (Adhvaryu) respectively; and the verses contained in them are to a large extent taken from the *Ṛiksaṃhitâ*, though not unfrequently with considerable textual variations. The *Ṛiksaṃhitâ*, on the other hand, though likewise assigned to a special class of priests—viz. the invokers (or sacrificers, Hotar), is not a sacrificial text-book in the same narrow sense of the word; but it has rather to be looked upon as a collection of all the sacred poetry preserved in the tradition of the leading priestly families which was within reach of the collectors and seemed to them worthy of being preserved for devotional purposes. The hymns recited by the Hotar at the sacrifices were, however, drawn almost exclusively from this collection, the study of which was therefore especially incumbent on him. The fourth class of priests, the Brahmans, whose function, as later elaborated, it was to superintend the entire sacrificial performance, had not, and could not from the very nature of their office have, any special text-book assigned to them; and it was doubtless from mere theoretic considerations that the *Atharvaveda* came ultimately to be regarded as specially connected with the Brahman priest.

More or less closely connected with the Brâhmaṇas are two classes of works—viz. the Âraṇyakas, or forest treatises, so called from the secret and esoteric nature of their subjects, which could not properly be imparted save in the seclusion of the forests; and the Upanishads, or secret doctrine, treating of the nature of the Brahman, or supreme spirit. In these works the ritualism of the Brâhmaṇas produces a reaction in which knowledge replaces the sacrifice as the end of man's life, and the philosophical tendencies already to be traced in certain hymns of the *Ṛik* are developed in a manner decisive for the future of Indian thought and ethics. The gradual elaboration of the sacrificial system also at length gave rise to ceremonial manuals, composed in the form of strings of concise rules (*sûtra*). These Kalpasûtras usually consist of two parts—viz. S'rautasûtras and Gṛihyasûtras, dealing with the great Vedic sacrifices and the ordinary domestic offerings and ceremonies respectively. In course of time the oral transmission of the canonical scriptures led to more or less serious discrepancies, as regards both the order of arrangement and textual readings, which gave rise to different schools recognising different recensions (*s'âkhâ*, lit. 'branch') of the sacred texts. The number of such different versions was at one

time very considerable, especially in the *Sâmaveda* and *Yajurveda;* but only a few of them have been preserved.

The *Ṛigveda-saṃhitâ* has come down to us in a single recension, that of the S'âkala school. It consists of 1028 hymns, composed in various metres, and arranged in ten books, or maṇḍalas. Book i. is mainly made up of sixteen collections of hymns ascribed to as many poets belonging to different families. Books ii.–vii., on the other hand, are attributed each to a special family of Ṛishis or seers—viz. the Gṛitsamadas, Kus'ikas (or Vis'vâmitras), Vâmadevas, Atris, Bharadvâjas, and Vasishṭhas respectively—whence they are usually called the family books. In the several collections of these seven books the hymns are arranged according to the deities to whom they are addressed —viz. Agni (god of fire), Indra (god of the sky), followed by minor deities. Book viii. consists mainly of hymns adapted by metrical (strophic) form for chanting as opposed to recitation, and for the most part belonging to the Kânva family of seers. Book ix. is made up exclusively of hymns addressed to Soma, the deified power of the intoxicating juice of the soma-plant, and used for recitation at the Soma-sacrifice (see SOMA). Book x., consisting like the first of 191 hymns, has the appearance of an appendage, containing for the most part hymns of later origin, though also doubtless including not a few genuine old hymns which had probably escaped the attention of the original collectors. The date at which the hymns were collected may be approximately fixed at 1000 B.C., while the composition of the earlier hymns would probably go back several centuries before that period. Efforts of scholars on the strength of astronomical allusions to place the composition of some of the hymns as early as 4000 B.C. may be safely disregarded. There is no great likelihood of the Aryans' presence in India before 2000 B.C. The Vedic Aryans, as pictured in the hymns of the *Ṛik*, were scattered in numerous clans extending from the Punjab and adjoining districts west of the Indus further to the east; the centre of the greatest religious and political activity indeed seems to have lain in the land known later as Kurukshetra, in the region of the river Sarasvatī, south of Ambâla. Their religion was mainly a worship of the powers and phenomena of nature; the favourite deities being Indra, for ever battling with the demons of darkness and drought; Agni (Lat. *ignis*), the genial inmate of the human dwelling in the shape of the household fire and the fire of sacrifice; Ushas (Lat. *aurora*), the fair awakener of the daily life; Soma; and Varuṇa (Gr. *οὐρανός*), the stern and ever-wakeful guardian of the sacred ordinances.

There is an English translation of the *Ṛiksaṃhitâ*, based on the Indian traditional interpretation, by H. H. Wilson, completed by E. B. Cowell; another, based on European exegesis, in metre, by Ralph Griffith; the hymns to the Maruts, or storm-gods, have been translated into English by F. Max-Müller; and a number of other hymns, by H. Oldenberg (*Sacred Books of the East*, xxxii. and xlv.).

The Brâhmaṇa of this Veda has been handed down in two distinct versions differing considerably, especially in their arrangement of the common matter—viz. the *Aitareya-brâhmaṇa* (trans. A. B. Keith) of the school of the Aitareyins; and the *Kaushîtaki* (or *S'âṅkhâyana*)-*brâhmaṇa* (trans. A. B. Keith) of the Kaushîtakins. The work deals exclusively with the various forms of Soma-sacrifice, and the consecration of the king. Each of the two schools has also its own Âraṇyaka (trans. A. B. Keith)—the *Aitareyâraṇyaka* and *Kaushîtaki-âraṇyaka*—certain portions of which are styled Upanishads. Similarly there are two complete sets of ceremonial rules, or Kalpasûtras, ascribed to Âs'valâyana (? 4th century B.C.) and S'âṅkhâyana respectively.

The *Sâmaveda-saṃhitâ* consists of two parts (or ârchika), the first of which contains the (585) verses to which the several sâman-tunes are usually sung, whilst the second gives the text of the made-up chants in the order in which they are required in the sacrificial ritual. The tunes themselves, on the other hand, are given in four special tune-books, called *Gâna*, attached to the Saṃhitâ. The latter, consisting as it does mainly of detached verses taken from the *Ṛiksaṃhitâ*, has only a technical interest. The mode of chanting somewhat resembled the Gregorian or Plain chant. The Brâhmaṇas of this Veda have a special character of their own, inasmuch as they are not different versions, or editions, of the same traditional exegetic and legendary matter, but altogether distinct treatises, dealing chiefly with chants. Nine such works are hitherto known, the most important of which are the *Tândya-brâhmaṇa*, also called *Pañchaviṃs'a*, consisting as it does 'of twenty-five chapters'; the *Shaḍviṃs'a-br.*, or 'twenty-sixth'; the *Chhândogya-br.*, including the *Chhândogya-Upanishad* (trans. F. Max-Müller); and the *Jaiminîya-* or *Talavakâra-br.*, of which the interesting *Kena-Upanishad* (trans. F. Max-Müller; H. Oertel), on the nature of the Brahman, forms part. There are also several ceremonial Sûtra-works connected with this Veda, among which may be mentioned the S'rautasûtra of Lâtyâyana and the Gṛihyasûtra of Gobhila.

The *Yajurveda* offers the spectacle of a complete schism, its teachers and followers dividing themselves into an older and a younger branch, or the *Black* and the *White Yajurveda*, traditionally so called from the form in which their canonical books were handed down. For, whilst the scriptures of the older branch presented a somewhat confused appearance, caused by the constant intermingling of the sacrificial formulas (*yajus*) and the exegetic portions (*brâhmaṇa*), the younger school adopted the practice of the followers of the *Ṛik* by dividing their scriptures into a regular Saṃhitâ, or collection of sacrificial formulas, and a Brahmaṇa. The older branch became again split up into numerous schools; four different recensions of their texts being so far known to us, the most important of which is the *Taittirîya-saṃhitâ* (trans. A. B. Keith), with an appendix called *Taittirîya-brâhmaṇa*, though characterised by the same motley intermixture of textual and exegetic matter. Slightly later are the *Kâṭhaka-saṃhitâ* and the *Maitrâyaṇî Saṃhitâ*, which have no Brâhmaṇas. There is further a *Taittirîyâraṇyaka*, part of which constitutes the *Taittirîya-Upanishad* (trans. F. Max-Müller). Of the Sûtra-works of the older schools several have come down to us, at least in part, the most complete being the *Baudhâyana-* and *Âpastamba-kalpasûtras*. Of the texts of the *White Yajus*—viz. the *Vâjasaneyi-saṃhitâ*, and the *S'atapatha-brâhmaṇa*, or Brâhmaṇa of a hundred paths (trans. J. Eggeling), which includes the *Bṛihad-âraṇyaka*, part of which forms an *Upanishad* (trans. F. Max-Müller), the recensions of two different schools are so far known to us—viz. the Mâdhyandinas and Kânvas, both of which recognised a common set of ceremonial rules, the S'rautasûtra of Kâtyâyana and the Gṛihyasûtra of Pâraskara.

The *Atharvaveda-saṃhitâ* is a collection of hymns and spells which, in importance and interest, ranks next to the *Ṛiksaṃhitâ*. The two collections present two different aspects of the religious belief of the ancient Hindus. Whilst the *Ṛik* reflects a belief in divine powers who are, on the whole, well disposed toward the Aryan man, and whose favour the worshipper is

confident of gaining by his sacrifice and song, the *Atharvaveda*, on the other hand, reveals a superstitious dread of a host of malevolent powers, the effects of whose ill-will man seeks to avert by means of incantations and magic practices. As the language and metre of the *Atharvaveda* present a more modern appearance than the main body of the *Ṛik*, the marked change in the religious spirit of the people is doubtless in part due to contact and intermixture with non-Aryan tribes. It is, on the other hand, very probable that superstitious rites of the kind favoured in the *Atharvaveda* had long been practised by the Aryan people, though they found no expression in the devotional lyrics approved by the priests. The *Saṃhitâ*, which is traditionally connected with the priestly families of the Atharvans and Angiras, is divided into twenty books, the last two of which are, however, later additions. The ordinary text of Northern India is usually ascribed to the S'aunaka school. A new recension, the Paippalâda, discovered in Kashmir, not only differs from it considerably in its arrangement, but also contains some new matter, amounting to about one-sixth of the whole. The Brâhmaṇa of this Veda, the *Gopatha* (or cowpath)-*brâhmaṇa*, containing cosmogonic speculations and explanations of certain sacrificial rites, borrows extensively from the older *Brâhmaṇas*, and is probably a comparatively modern work; whilst of the two ceremonial Sûtras, the *Vaitâna* (or *s'rauta*)-*sûtra* and the *Kaus'ika-sûtra* (a manual of domestic rites), the latter is by far the more interesting, and is probably the older, contrary to the usual rule of relationship of the classes of Sûtras. The *Atharvaveda* has also usually assigned to it a large number of Upanishads, amounting to considerably over a hundred. They are evidently of various ages, many of them coming down to very recent times.

See the article SANSKRIT; Max-Müller, *History of Ancient Sanskrit Literature;* J. Muir, *Original Sanskrit Texts;* W. D. Whitney, essay on Veda, in *Oriental and Linguistic Studies;* A. A. Macdonell, *Sanskrit Literature;* M. Bloomfield, *Atharvaveda.*

Vedanta. See SANSKRIT, p. 89.

Veddas, a very primitive people, of whom a handful survive in the forests of eastern Ceylon. They are short in stature, with very small long skulls, moderately broad noses, pointed chins, often prominent brow ridges, and have been classed as Pre-Dravidians. Some have taken to tillage, and even the 'wild' Veddas, who live upon honey, game, and what else they can get in the forest, have adopted an Indo-European language from the Sinhalese. See CEYLON, and a valuable study by C. G. and B. Z. Seligmann (1911).

Vedder, ELIHU (1836–1923), painter, was born at New York and studied at Paris and in Italy, where he ultimately made his residence. His subjects are mostly decorative and ideal.

Vedettes are mounted Sentinels (q.v.) in advance of the outposts of an army.

Veen. See VAN VEEN.

Vega. See GARCILASO DE LA VEGA.

Vega Carpio, LOPE FÉLIX DE, was born in 1562 at Madrid, but of a family that had its seat on the Vega of Carriedo, south of Santander. The story of Lope's life, as commonly told, is full of confusion. That he lost his parents early; was a student and graduate of Alcalá; a soldier in the Portuguese campaign of 1580, and in the Armada, 1588; secretary to the Duke of Alva, Marquis of Malpica, and Marquis of Sarria; had many amours, was twice married, and father of at least six children, three of them illegitimate; was banished from Madrid because of a quarrel, and lived two years at Valencia; took orders, became an officer of the Inquisition, and died at seventy-three a victim to hypochondria—all this is indisputable, but the order and relation of the facts are by no means clear. Too much reliance has been placed upon his friend and biographer, Pérez de Montalván, who suppresses everything touching his reputation, and, knowing him only in his ascetic days, and being forty years his junior, was not likely to hear much from him about his love-affairs and early adventures. Lope himself, too, increases the confusion by his obscurity and invariable practice of making himself out younger than he was in his reminiscences. Thus he has puzzled Schack and Ticknor by giving his age as fifteen when he fought against the Portuguese at Terceira, a thing he had no opportunity of doing until he was twenty. On Montalván's authority it is said that on leaving Alcalá he attached himself to the Duke of Alva (i.e. the third duke, the Alva of history), at whose instance he wrote the pastoral romance of the *Arcadia*, that soon afterwards he married and was banished, and that grief on the death of his wife drove him to join the Armada. But his own words in the *Eclogue to Claudio* and in the *Dorotea* (Act V. sc. viii.) show that it was not the loss of a wife, but trouble with a mistress, Filis, *alias* Dorotea, that sent him to sea; and that his marriage came later; and abundant evidence, internal and external, proves that the *Arcadia* was written after the Armada, and not for Duke Ferdinand, but for his grandson Antonio, the fifth Duke of Alva. It is, in fact, the story, in a pompous, pastoral setting, of the young duke's matrimonial vacillations in 1589–90, the sober prose version of which may be found in Cabrera's *Felipe Segundo* (part ii.). It must have been soon after this that he married his first wife, Isabel de Urbina, and got into the scrape that drove him to Valencia, for both events are referred to in the *Romancero General*, in ballads written at the latest in 1593. He hints at a woman's revenge as the cause of the latter; but in a petition to the king in 1598 he specifies 'certain satires against a manager,' for which he was sentenced to ten years' banishment and suffered two, the remainder being remitted. The only issue of his marriage that we hear of was a daughter, Theodora, whom he calls 'the consolation of his exile.' The year of his wife's death is uncertain, but about 1600, apparently, he married Doña Juana de Guardio. Soon after marriage he had a *liaison* with one Doña Maria de Luxan, the fruit of which was two children born in 1605 and 1606, Marcela, who took the veil in 1621, and Lope, who was drowned at sea the same year. By his wife he had also a son and a daughter, Carlos, who died in childhood, and Feliciana, who survived him. In giving birth to the latter (1612) the mother died, and Lope, already a Familiar of the Inquisition, took orders, resolved, Montalván says, to devote himself to the welfare of his soul; but three years later a woman, beautiful, brilliant, and 'mated with a clown,' crossed his path, and after a struggle he yielded to his destiny. Tenderness for his name has withheld the mass of his letters to his friend and patron the Duke of Sessa, but a few bearing on this episode were printed in 1876, and it was as well they were, for they dispose of some of the worst imputations against him—e.g. that of having been pander in the duke's amours, which is only true in so far that he drafted his love-letters. But they are evidence of deplorable moral laxity. He was no hypocrite: he had a conscience, and it troubled him sorely; but the opiates of the church enabled him to lay it to sleep, and as soon as it was silent he fell to sinning again. Out of his own mouth he is proved to have been a miserable weak man with passions too strong for him. A daughter

born to him in 1617, to whom he was tenderly attached, as indeed he was to all his miscellaneous offspring, deserted him, it seems, in his old age, and his last years were darkened by sorrow as well as remorse. He took to practices of the severest asceticism, and, sinking at last into what Montalván describes as a 'continued melancholy which of late has been called hypochondria,' he died, August 27, 1635. His funeral was more like a prince's than a poet's, and the largest and most illustrious concourse ever seen in Madrid followed his remains along the same street where Cervantes had been carried to his obscure grave on the shoulders of four friars; a contrast, yet not greater than that between the cheerful serenity of the one deathbed and the gloom that lay heavy upon the other. He died poor, but not because of his Castilian love of pomp and display, as Sismondi assumes. His large income from his dramas and other sources was all but wholly devoted to charity and church purposes. His tastes, wants, and habits were of the simplest; a little flower-garden a few yards square was his one luxury, and a few books and pictures all his worldly goods.

The mere list of Lope's works presents a picture of unparalleled mental activity from boyhood to old age. He wrote plays, he says, in his twelfth year, and certainly wrote some not much later, but his first work of any length was a characteristic attempt in twenty cantos to prove that his was the *miglior plettro* to which Ariosto left the completion of Angelica's story. It was written at sea in 1588, but not printed till 1602. The *Arcadia* was written, as book v. shows, before the Duke of Alva's marriage, July 1590, but he, no doubt, was not eager to see in print pre-nuptial vagaries, which had already, as Cabrera says, 'made a noise,' and it was kept back till 1598. The *Dragontea*, a shout of exultation in ten cantos over the death of the Dragon, Drake, the destroyer of Spanish naval supremacy, appeared at Valencia the same year, but a few months earlier, and was Lope's first publication with his name. But it was as a ballad-writer that he first made his mark. The 'Flores de Romances,' the little 'garlands' out of which the *Romancero General* was formed, had begun to come out at Valencia when he was there in 1590–92, and of the contributors of the Moorish and pastoral ballads in vogue 'Belardo' (his name in the *Arcadia*) was, we learn, the most esteemed. Of his miscellaneous works some, like those on St Isidro and his canonisation, and on the marriage of Philip III., are merely occasional, and others owe their escape from utter oblivion solely to his name. The more notable are the *Rimas* (1602), comprising the *Angelica*, 200 sonnets, and a reprint of the *Dragontea;* the *Peregrino en su Patria* (Seville, 1604), a romance on the model of *Theagenes and Chariclea*, with a preface giving his views on the drama, and a list of the 219 plays he had already produced; the *Jerusalén Conquistada* (1609), an epic in twenty books in competition with Tasso; the *Pastores de Belén* (1612), a religious pastoral; *Filomena* and *Circe* (1621–24), miscellanies in which he tried to rival the *Novelas* of Cervantes; the *Corona Trágica* (1627), an epic with Mary Stuart for heroine; the *Laurel de Apolo* (1630), a poem on the pattern of Cervantes' *Viage del Parnaso;* the *Rimas de Tomé de Burguillos* (1634), a collection of his lighter verse, with the *Gatomaquia*, a mock-heroic. The most noteworthy of all is the *Dorotea* (1632), in form a prose drama, but obviously the story of his own early love adventures from 1583 up to a little before the sailing of the Armada, with a prediction from an astrologer of his marriage, imprisonment, and banishment.

Originality, it will be seen, was not Lope's forte. He was fonder of following in the wake of others than of striking out a line of his own. He was always measuring himself against any one who had achieved success, and always unsuccessfully. All these works show the hand, not of a great artist, but of a consummate artificer. The merits of Lope's verse are undeniable. He was a master of easy, flowing, musical, graceful verse; but he rarely passes the frontier line between mere excellent verse and poetry, and never tarries long when he does. Once only he seems to write from his heart and not from his head, in the ballad on his first wife's grave, visited on a bright spring day when the trees were coming into leaf, the birds singing gaily, the lambs frisking round him, and all nature as usual unsympathetic with sorrow. These *obras sueltas*—detached works—of Lope's shine in fact in the reflected light of his dramatic renown. It is clear that though he had written plays he did not become a writer for the stage until after 1588. From his quarrel with a manager, it seems he had tried his hand at Madrid; but no doubt it was at Valencia, where it was more forward, that he served his apprenticeship to the drama. Not the least of his many gifts was his intuitive perception of the Spanish playgoer's tastes. He saw what his predecessors, Cueva, Virues, Argensola, Cervantes, all failed to see, that the public did not care for tragic emotion or development of character or passion; that what it wanted was excitement pure and simple, and that a drama that ignored a craving which had been utilised by the Inquisition, been the mainstay of chivalry romance, and had made the bull-fight a sacred institution, could never become a popular national drama. In the *New Art of Comedy-writing* and in the *Peregrino* he puts the case with a candour almost cynical. It is true, he says, that plays written in defiance of the rules of art are barbarous, but the public does not trouble itself about the unities, or the twenty-four hours rule, or inconsistencies, or improbabilities, and he who would be listened to must put away all restrictions that hamper him, and make it his business to give the public what it asks for, even if that be nonsense: he who pays the piper calls the tune. The great point was not to allow the excitement to flag for an instant, and to drop no hint of how the play was going to end; the *enredo*—not 'plot' but 'entanglement'—was all in all. Lope's qualifications for this were extraordinary. His invention was boundless. He could string striking situations and ingenious complications one after another without stop or stay, and keep the audience breathless and the stage in a bustle for three long acts, all without a sign of effort. Not less astonishing was his mastery of easy musical verse that charmed the ear and gave additional brilliancy to the dialogue. And then, long before one play had ceased to excite he was always ready with another as good or better. It is no wonder that Cervantes called him a prodigy of nature, or that he was idolised by the nation which for forty years he kept supplied with the stimulant it craved. Imagination or creative power need not be looked for in Lope's drama; they were not among his gifts, and would have been useless if they had been. His dramatis personæ, for the most part, have no more individuality or character than a batch of puppets. Don Luis of one play is only Don Lope of another in a different wig and doublet, declaiming rage, jealousy, or despair with precisely the same unchanging wooden countenance. In principle Cervantes was right in his strictures on Lope's drama, but on the practical question he was wrong, as is amply proved by the reception given to the plays of Alarcón, a dramatist in a sense in which neither Lope nor Calderón could claim the title. As regards his relations with Cervantes, Lope has not been fairly treated. The charge of malignity rests upon his disparagement

of *Don Quixote* and its author in a private letter, and his silence in public as to the merits of the book. He would have been a marvel of magnanimity if he had liked either. Impartiality must allow that Cervantes was the aggressor. His attack was in the language of a courteous gentleman and an honest critic, but it was an attack all the same; and the sly hits at little vanities that accompanied it could not but be galling to a vain and sensitive man. As for the charge brought by Don Ramón León Mainez, that Lope was 'Avellaneda,' that rests on nothing at all, and evidence must be forthcoming before any one who knows human nature will believe that a gallant soldier who had fought in the Armada sneered at another for having been wounded at Lepanto.

Lope's plays have been elaborately classified by Schack, Hennig, and others, but for convenience they may be roughly divided into the historical or quasi-historical (including legendary and sacred dramas) and those that deal with every-day life. Of the latter the most characteristic in every way are the 'Comedias de capa y espada'—cloak and sword plays—a picturesque title that puts the principal figures before the eye. They are as a rule dramas of upper-class society, in which love, gallantry, jealousy, and above all the hyper-sensitive Spanish honour supply the necessary complications. The *Noche de San Juan*, one of Lope's very last plays, the *Maestro de Danzar*, one of his first, and the *Azero de Madrid*, the source clearly of Molière's *Médecin Malgré Lui*, are excellent specimens. It is not easy to make a selection of typical characteristic examples out of a repertory so vast and varied as Lope's, but his peculiarities and excellences as a dramatist may be studied with advantage in such plays as the *Perro del hortelano*, the *Desprecio agradecido*, the *Estrella de Sevilla*, the *Esclava de su Galán*, the *Premio del bien hablar;* and no student of Calderón should overlook the *Alcalde de Zalamea*, which, if not better than Calderón's famous play, as Chorley thought it, is unquestionably the bold vigorous outline that left little more than filling in to be done by Calderón's hand, and is one more proof that later dramatists found Lope, as Fuseli said the painters found Blake, 'good to steal from.'

The number of Lope's plays is given by Montalván as 1800, exclusive of 400 *autos;* but this is obviously excessive, as he wrote but few during the last two or three years of his life, and in 1632 the number is put at 1500 both by himself in the *Eclogue to Claudio* and by Montalván in *Para Todos*. This is probably near the truth, as it agrees with the rate of production indicated by other statements. In 1603 he had written 230; in 1609, 483; in 1620, 900; and in 1624, 1070. Of these the very names of all but 608 according to Barrera, 680 according to Chorley, have been lost, in a great many cases nothing but the name has survived, and frequently one play is represented by two names. All necessary deductions made, we have about 440 plays and 40 *autos* in print or MS. Some have been printed singly or in general collections, but the greater number are to be found in the *Comedias de Lope de Vega*, a series of 25 volumes of which 9–21 were authorised by himself. A selection comprising about a fourth of the extant plays, edited by Hartzenbusch, fills 4 volumes of the *Biblioteca de Autores Españoles*. The non-dramatic works were collected and published at Madrid in 1776–79 in 21 handsome volumes; and a selection fills vol. xxxviii. of the *Bib. Aut. Esp.* The Spanish Academy published an edition of his works (1890 *et seq.*).

See SPAIN (*Literature*), and the works there cited, also Barrera's *Catálogo del Teatro Español;* Lord Holland's *Life* (1817), Chorley's *Catálogo de Comedias y Autos de Lope de Vega* (1860), Hennig's *Studien zu Lope de Vega* (1891), the work by Wurzbach (in Ger. 1899), the essay by Fitzmaurice-Kelly (1902), and the important Life by H. A. Rennert (1904).

Vegetable Ivory. See IVORY (VEGETABLE).

Vegetable Kingdom. Early writers on plants were apt to look more to medicinal properties than natural relationship. Cæsalpinus, however, 'primus verus systematicus,' as Linnæus called him, made an attempt at classification in his *De Plantis* (Florence, 1583). He divided plants into trees and herbs, divided these again, mainly according to the character of seed and fruit, into 15 classes with 47 sections. Robert Morison also began with the division into trees and herbs, and proceeded to draw up his system of 18 classes and 108 sections on the basis of flower and fruit, as well as other characters. His *Plantarum Historia Universalis Oxoniensis*, with its continuation by Bobart (1680–99), describes herbaceous plants only; the proposed volume on trees never saw the light. In Ray's *Methodus Plantarum* (1682) first appears the familiar division of flowering plants into monocotyledons and dicotyledons, with the subdivisions into apetalous, monopetalous, and polypetalous. Tournefort again, in *Institutiones Rei Herbariæ* (1700), divides primarily into herbs and trees; then he takes into account presence or absence of petals, the distinction of simple and composite, monopetalous and polypetalous, regular and irregular.

Linnæus, in his artificial system, divided plants into 24 classes thus:

Flowers all hermaphrodite. Stamens equal and not united:

1. Monandria (1 stamen).
2. Diandria (2 stamens).
3. Triandria (3 stamens).
4. Tetrandria (4 stamens).
5. Pentandria (5 stamens).
6. Hexandria (6 stamens).
7. Heptandria (7 stamens).
8. Octandria (8 stamens).
9. Enneandria (9 stamens).
10. Decandria (10 stamens).
11. Dodecandria (11 to 20 stamens).
12. Icosandria (many stamens, joined to calyx).
13. Polyandria (many stamens, on receptacle).

Stamens unequal:

14. Didynamia (4 stamens; 2 long, 2 short).
15. Tetradynamia (6 stamens; 4 long, 2 short).

Stamens united:

16. Monadelphia (filaments joined in 1 bundle).
17. Diadelphia (filaments joined in 2 bundles).
18. Polyadelphia (filaments joined in more than 2 bundles).
19. Syngenesia (anthers joined).
20. Gynandria (stamens joined to pistil).

Unisexual flowers:

21. Monœcia (monœcious).
22. Dicœcia (dicœcious).
23. Polygamia (male, female, and hermaphrodite flowers on the same or different plants).

Flowerless plants:

24. Cryptogamia.

Linnæus also made a beginning towards a natural system.

A. L. de Jussieu's system, published in his *Genera Plantarum* (1789), was an important advance in this direction. He distributed the families in 15 classes, thus:

- Acotyledones ..... 1.
- Monocotyledones
  - Stamens hypogynous ..... 2.
  - ,, perigynous ..... 3.
  - ,, epigynous ..... 4.
- Dicotyledones
  - Apetalæ
    - Stamens epigynous ..... 5.
    - ,, perigynous ..... 6.
    - ,, hypogynous ..... 7.
  - Monopetalæ
    - Corolla hypogynous ..... 8.
    - ,, perigynous ..... 9.
    - ,, epigynous
      - anthers connate ..... 10.
      - anthers separate ..... 11.
  - Polypetalæ
    - Stamens epigynous ..... 12.
    - ,, hypogynous ..... 13.
    - ,, perigynous ..... 14.
  - Diclines irregulares (unisexual flowers) ..... 15.

De Candolle's system may be thus represented :

- Vasculares
  - Exogenæ
    - Diplochlamydeæ
      - Thalamifloræ.
      - Calycifloræ.
      - Corollifloræ.
    - Monochlamydeæ.
  - Endogamæ
    - Endogamæ Phanerogamæ.
    - Endogamæ Cryptogamæ.
- Cellulares
  - Foliaceæ.
  - Aphyllæ.

Endlicher, in his *Genera Plantarum* (1836–40), bases his system on Jussieu and De Candolle :

- Thallophyta
  - Protophyta
    - Algæ.
    - Lichenes.
  - Hysterophyta
    - Fungi.
- Cormophyta
  - Acrobrya
    - Anophyta (Bryophytes).
    - Protophyta (Pteridophytes and Cycads).
    - Hysterophyta (Balanophoraceæ, Rafflesiaceæ, &c.).
  - Amphibrya (Monocotyledons).
  - Acramphibrya
    - Gymnosperma.
    - Apetala.
    - Gamopetala.
    - Dialypetala.

This division turns first upon the presence or absence of differentiation with stem and root; then on growth at the point, the circumference, or both; and on the petals; the gymnosperms being thrown in with the dicotyledons.

This last arrangement is still familiar to British botanists in the system of Bentham and Hooker, who thus divide the flowering plants (1862–83) :

- Dicotyledones
  - Polypetalæ.
  - Gamopetalæ.
  - Monochlamydeæ or Incompletæ.
  - Gymnospermæ.
- Monocotyledones.

Alexander Braun (1864) modified the artificiality of the apetalous group by placing some of its families along with those that have separate petals in the Eleutheropetalæ :

- Bryophyta
  - Thallodea (Algæ, Lichens, Fungi).
  - Thallophyllodea (Characeæ, Mosses, Liverworts).
- Cormophyta
  - Phyllopterides (Ferns, Horse-tails).
  - Maschalopterides (Lycopods).
  - Hydropterides (Water-ferns).
- Anthophyta
  - Gymnospermæ
    - Frondosæ (Cycads).
    - Acerosæ (Conifers).
  - Angiospermæ
    - Monocotyledones.
    - Dicotyledones
      - Apetalæ.
      - Sympetalæ.
      - Eleutheropetalæ.

Progress has been helped by the replacing of long verbal descriptions by diagrams, introduced by De Candolle and greatly developed by Eichler in his *Blüthendiagramme* (1875–78), which led to better classifications from a purely morphological standpoint.

Like Eichler, Engler improved upon Brongniart and Braun, and his system became generally accepted. It thus divides the plant world :

- Myxothallophyta.
- Euthallophyta.
- Embryophyta Zoidiogama
  - Bryophyta.
  - Pteridophyta.
- Embryophyta Siphonogama
  - Gymnospermæ
    - Cycadales.
    - Bennettitales.
    - Cordaitales.
    - Ginkgoales.
    - Coniferæ.
    - Gnetales.
  - Angiospermæ
    - Monocotyledoneæ.
    - Dicotyledoneæ.

The Myxothallophyta are divided into Acrasieæ, Phytomyxineæ or Plasmodiophorales, and Myxogasteres. (See MYXOMYCETES.)

The Euthallophyta include Schizophyta (see CYANOPHYCEÆ, BACTERIA), Flagellata (in the border region between plants and animals : see INFUSORIA), Euphyceæ or true algæ see ALGÆ, SEAWEEDS, DIATOMS), Eumycetes or true fungi (see FUNGI).

The Bryophytes consist of the Hepaticæ (see LIVERWORTS), subdivided into Marchantiales, Jungermaniales, and Anthocerotales; and the Musci (see MOSSES), subdivided into Sphagnales, Andreæales, Archidiales, and Bryales.

The Pteridophyta Engler divides into Filicales, Equisatales, Sphenophyllales, and Lycopodiales. (See PTERIDOPHYTA, and the references there.)

The Embryophyta Siphonogama are more familiar under the old-fashioned name of Phanerogams, or under that in favour at the present day, Spermatophyta (q.v.). There are articles in this encyclopædia on Gymnosperms, Monocotyledons, and Dicotyledons, and on most of their families.

The Dicotyledons are divided into Archichlamydeæ and Sympetalæ. The grouping of the cohorts and families under these will be found conveniently given in Willis's *Flowering Plants and Ferns*, where the relation between Engler's system and the very similar arrangement of Eichler is also shown.

The effect of evolutionary ideas may be traced in Warming's *Haandbog i den systematiske Botanik* (Eng. trans. by Potter, 1904), and Wettstein's *Handbuch der systematischen Botanik* (3d ed. 1923). No quite satisfactory classification of plants has yet been constructed, nor indeed can one be until a thoroughly evolutionary point of view is adopted. Lines of descent will have to be traced with the help of the palæontologist. Such crude divisions as rigorously separate all dicotyledons with united petals from such as have them free gradually give place to more natural arrangements. Development may proceed in many parallel lines. Even such questions as how the angiosperms sprang from the gymnosperms, or where the monocotyledons broke away from the dicotyledons, may prove to have more than one answer. Upon such questions recent discoveries of fossil plants have an important bearing. (See, for example, PTERIDOSPERMS, RHYNIACEÆ.)

The student may consult text-books such as Bentley's *Manual of Botany;* Henfrey's *Botany;* Asa Gray's *Botany;* Goebel's *Outlines of Classification and Special Morphology* (Oxford, 1887); Mrs Hooker's translation of Le Maout and Decaisne's *Botany;* Van Tieghem's *Traité de Botanique* (Paris, 1891); Kerner's *Pflanzenleben* (Eng. adaptation by Oliver); Strasburger's *Text-book of Botany* (often re-edited and translated); and for fuller information the great works—Bentham and Hooker's *Genera Plantarum*, Baillon's *Histoire des Plantes*, Engler and Prantl's *Pflanzenfamilien*, Engler's *Pflanzenreich*. For local plants he should consult the various floras such as Dr G. C. Druce's for several British counties, British floras by Bentham, Hooker, Babington, &c.; and the great illustrated works, Sowerby's *English Botany* and C. E. Moss's *Cambridge British Flora* (vols. ii., iii., 1914–20). See also articles BIOLOGY, BOTANY, GEOGRAPHICAL DISTRIBUTION, PHYSIOLOGY (VEGETABLE), PLANTS, and the like.

Vegetable Marrow. See GOURD.

Vegetable Parchment. See PARCHMENT.

Vegetable Sheep, a name given to several composites of the genera Haastia and Raoulia (*H. pulvinaris, R. eximia, R. bryoides*, &c.) inhabiting the shingle-slips of the New Zealand Alps. With their tightly compressed stems, branches, and woolly leaves they form very compact hummocks, 6 feet by 3 or more, easily mistaken at a distance for sheep. This habit is a protection against drought.

Vegetarianism is popularly defined as the practice of eating foods obtained from the vegetable kingdom exclusively, and abstaining from all foods obtained from the animal kingdom. This is an approximately correct definition of what was meant by the word when the Vegetarian Society was founded in 1847. It was not

long, however, before it was discovered that there was as great a need of discrimination in the use of the various products of the vegetable kingdom as there was cause to abjure the use of flesh. Vegetables are not all equally wholesome, some are absolutely poisonous. There is a great difference between the stalks and leaves and the seeds of plants. Cooked and uncooked foods differ greatly. The study of food leads to the study of equally important laws. Eggs, milk, cheese, butter (animal *products*) differ from the carcasses of slaughtered animals. Many of the arguments against the use of flesh do not apply to the use of fish. These and similar questions arose, and so sects sprang up. Some ate fish; some were called Vems (eating Vegetables, Eggs, and Milk); some were *strict* vegetarians or Vegs (excluding all animal products) and some took up the Edenic diet (excluding all cooked food).

Since it is believed that the eating of flesh is antagonistic to progress on many grounds, and that reform in food is the basis of all individual reform, the renunciation of flesh in whole or in part is made the test question of vegetarianism, leaving the positive question of what articles in the vegetable kingdom constitute man's proper food to be one of the branches of further study. In support of abstinence from flesh the following ten claims are made: I. Physiology proves man to be closely akin to the frugivorous ape and essentially different from the carnivora, herbivora, or omnivora. But it is objected that man has canine teeth, and his intestines of mid length between the herbivora and carnivora show that he should partake of the food of both. To this the reply is that canine teeth are found in apes also; and the mean length of his intestines proves rather that he is fit for *neither* than for *both* forms of food, for grasses need long intestines which he has not got, and flesh needs to be passed away very rapidly through intestines shorter than man's, to prevent putrefaction. Physiologically and anatomically man can scarcely be differentiated from the higher apes. II. Embryology shows that to be a permanent differentiation of type which comparative anatomy shows to be actually different: the typical herbivora being placentally non-deciduate, the carnivora zonary deciduate, and apes and men discoidally deciduate. III. Chemistry proves that all elements for perfect nutrition in assimilable forms are found in a proper vegetarian dietary. It is objected that (*a*) an enormous bulk must be consumed to get the requisite nutriment; (*b*) flesh is food ready prepared by another animal, and so requires less vital strain to assimilate it than vegetable food. It is replied that (*a*) increased bulk is not necessary—e.g. of flesh alone it would be necessary to eat 96 oz. per day to get sufficient carbon; of bread alone, 64 oz. to get enough proteids; of mixed flesh and bread, 42·3 oz. (34·5 oz. bread and 7·8 oz. beef) would suffice; similarly 34·6 oz. of a mixture of 9·5 oz. lentils and 25·1 oz. of bread, or 24·1 oz. of almonds and raisins, would give the same result; (*b*) animal cells are not absorbed as cells, but must be broken down and converted to chyle before absorption, so that assimilableness varies as much between different sorts of flesh as between flesh and non-flesh foods. Thus pork takes, raw, 3 hours; well roasted, 5¼ hours; beans, 3½ hours; beef, raw, 2 hours; well boiled, 2¾ to 3 hours; well roasted, 3¼ to 4 hours; rice, boiled, 1 hour; fresh-baked bread, 3½ hours to digest. IV. Flesh as sold is diseased to a very high percentage by diseases communicable to man, which the purchaser is quite unable to detect. V. Higher instincts revolt against taking life, and the repression of these higher instincts prevents evolution of the higher man; while the relegation of the function of slaughtering to others is the unjust perpetuation of a degraded class to be an ever-constant source of danger to the stability of the morality of the community for the sake of supplying the luxurious demands of an artificial appetite. The objection made is that butchers are often kind and gentle, and that other occupations produce types of men as low as slaughtermen. VI. Unnecessary destruction of life is immoral. Objections are made—(*a*) that it begs the question to say that flesh food is unnecessary; (*b*) the land would be overrun if the animals were allowed to breed unhindered; (*c*) is it not more merciful to breed, tend, feed, and painlessly kill, than allow the animals to battle for existence and then die of hunger or fall a prey to the carnivora? The reply to these difficulties is—(*a*) physiology and chemistry prove flesh to be unnecessary; (*b*) the balance of nature prevents overrunning—e.g. is any new land when discovered overrun with animals, although they have had countless ages in which to propagate unhindered by man's interference? (*c*) the problem presented is hypothetical, for in reality the cruelties inflicted by man on the animal world are appalling, and for these cruelties the habit of flesh-eating is to a great extent responsible. VII. It is economically superior—for 1·281 lb. of oatmeal at a cost of 4d. will supply power to raise 140 lb. to the height of 10,000 feet, while of beef fat it would take ·555 lb. at a cost of 5d., or of beef lean 3·532 lb. at a cost of 3s. 6½d. On the other hand it is said that if *all* were to adopt it it would simply mean an all round depreciation of wages by a reduction of the subsistence minimum. VIII. Physical strength increases, as proved by the usually superior physique of peasants to that of middle classes; Arab porters, Indian runners, and Scotch and Irish peasants are especially pointed out as physically above the average, while the frugivorous gorilla is noted for enormous strength. But it is objected that (*a*) men who are so fed improve when flesh is added to their diet; (*b*) many Hindus are puny and staminally weak. It is replied that (*a*) they appear to improve because flesh is a stimulant, and so transforms latent energy into manifest force; (*b*) it is not claimed that a diet chiefly composed of rice is the best, while the fact that many fine races do live without flesh proves that under such conditions at any rate it is not a necessity; and immediately the non-necessity is admitted the whole weight of the moral argument enters the scale against the habit. IX. Whereas 12 acres of land, if used for the rearing of cattle for slaughter, will maintain one man feeding on the flesh produced, the same area under wheat will maintain twenty-three, and on a mixed crop of fruit, pulse, grain, and vegetables a still higher number. The objection here is that much land is suitable for nothing else but, e.g., sheep runs. By the vegetarian this may be granted, but the assertion does not apply to the thousands of acres of valuable horticultural land now under grass. X. It is claimed that horticulture, and especially *petite culture*, would employ an enormously greater amount of labour than does stock-raising, and so tend to afford a counter current to the present townward drift and to congested labour centres.

Vegetarianism has spread so extensively that in addition to its pledged adherents it has a still greater number who practise abstinence from flesh to a greater or lesser degree in obedience to medical advice, for the curing or relieving of disorders of digestion, gout, and rheumatism. The Catholic Church enjoins abstinence from flesh during Lent, and on some other days during the year. Many religious orders (e.g. the

Trappists) abstain wholly from flesh. Brahmins also abstain from flesh and eggs. During the last decade the greatest change has been the increasing tendency to lay greater stress on fruits and nuts and salads and to reduce the consumption of the legumens. In nomenclature the word 'Fruitarian' is largely replacing the word 'Vegetarian.' It is claimed that the word fruitarian scientifically defines the dietary of one who lives on 'the kindly fruits of the earth,' on the 'fructus' or produce of the soil and of the creatures upon it —without the destruction of life. Thus milk is the 'fructus' or produce of the cow, and therefore as a Fruitarian you may drink the milk from, but may not eat the dead body of the cow. So eggs are the 'fruits' of the fowl and they may therefore be eaten, but not the hen which laid them. It is claimed that the use of nuts and of cheese solves the problem of proteins, and that the use of salads and fruits provides a plentiful supply of vitamins and potassium salts, and that a rightly selected fruitarian dietary improves health, stamina, and complexion, and postpones the deposits which are the causes of old age.

The chief societies in England are the Vegetarian Society (headquarters at Manchester), the Order of the Golden Age, The Fruitarian Society, and the London Vegetarian Society (headquarters of these are in London).

See John Smith, *Fruits and Farinacea;* Alcott, *Vegetable Diet;* Francis W. Newman, *Essays on Diet;* Kingsford and Maitland, *The Perfect Way in Diet;* Howard Williams, *Ethics of Diet;* Braithwaite, *Plainer Fare;* A. Broadbent, *The Building of the Body;* and various works by Josiah Oldfield.

Vegetius (in full, Flavius Vegetius Renatus), a Roman author who about 375 A.D. wrote the famous *Epitome Institutionum Rei Militaris*, mainly extracted from other authors, which during the middle ages was a supreme authority on warfare.

Veglia (Croat. *Krk*), an island of Yugoslavia in the Adriatic, south-east of Fiume. Area, 165 sq. m.

Vehmgerichte (also spelt *Femgerichte*, or simply *Vehme*, *Fehme*), dread tribunals in Germany during the middle ages, empowered by the emperor to try cases in which the penalty was death, and to execute the punishment on the guilty. They were doubtless based on ancient Germanic methods of tribal justice, though the tradition refers their institution to Charlemagne. It was in Westphalia they were especially powerful, and this is explained by the fact that, whereas in other German lands the ruling princes assumed to themselves all capital jurisdiction, in Westphalia there were for long no territorial potentates strong enough to take over the authorities originally peculiar to the emperor alone and those specially commissioned by him. The anarchical condition of Germany favoured the extension of the Vehmgerichte; and in the 14th century the solemnly initiated members of this tribunal, called *Schöffen* or *Freischöffen*, were found scattered all over Germany. Wherever he lived, the Schöffe could be tried capitally only by the Westphalian court; princes found it convenient to be initiated themselves and choose *Schöffen* for their advisers, and free cities aimed to have their councillors associates of this august body. Any free German born in wedlock might be admitted with solemn formalities, after taking an awful oath to be faithful to the duties and privileges of the order, on pain of an ignominious and specially painful death. The chief of the society, the *Oberstuhlherr*, was the emperor's representative, namely the Archbishop of Cologne as Duke of Westphalia. The *Stuhlherr* was the chief at any given Stuhl or seat of justice, of which the most famous was in the market-place of Dortmund. Officers or *Freigrafen* were named by the Stuhlherren. Any free man might attend the meetings, always held by daylight in the open air, unless the court specially resolved itself into a secret tribunal for the time being; and even then the number of members in important cases took away any real 'secrecy' from the trials. Thus eighteen Freigrafen and 800 Freischöffen took part in the trial of Duke Henry of Bavaria in 1434. The places and times of meeting were perfectly known to all who cared to know. The summons was not delivered personally but usually fastened to the door of the accused. The mode of trial—by accusation and pleading in defence—was the same as in other German courts; and for centuries the power of the Vehme seems to have been used for the best ends, with a full feeling of responsibility and love of justice. Torture was never had recourse to: the convicted prisoner was usually executed at once, or whenever he was found, by being hanged on the nearest tree, a dagger with the device of the society, the mysterious letters S.S.G.G. (whose meaning is unknown), being fixed beside the corpse to show by whose decree the man died. Gradually abuses crept in; the dread powers were used in personal feuds; and the minor princes became more and more jealous. Maximilian subjected the Vehme to very stringent regulations; already in the 16th century they were strictly confined to Westphalia, and gradually subordinated even there to the ordinary courts. They continued to exist, maintaining the ancient formalities, though now bereft of power and little better than a laughing-stock, till they were finally dissolved in 1811 by Jerome Bonaparte. The last Schöffe died in 1835.

There is an extensive literature on the subject, a series of monographs having corrected many picturesque but erroneous conceptions of the once so formidable secret tribunal. Amongst them are those by Berek (1814), Usener (1832), Essellen (1877), Wächter (1882), Lindner (1887 and 1890), Thudichum (1889), Wiegand (1893), and Schnettler (1921). There is a graphic account of the Vehme in Immermann's *Münchhausen;* see also Scott's *Anne of Geierstein*, with the introduction. The etymology of the name in its various forms has been much debated, but is quite obscure.

Veii, an ancient city of Etruria (q.v.), in early times the formidable rival of Rome, near Isola Farnese, 12 miles from Rome. If traditional history is to be believed, it waged fourteen distinct wars with Rome—an almost incessant warfare down to its capture after a ten years' siege by Camillus (396 B.C.). The site is one of great natural strength, a plateau nearly as extensive as the site of Rome as enclosed by the 'Servian' wall, almost entirely isolated by deep ravines and further defended by walls. Only small parts of the site have been excavated. The most important discoveries have been those of a large cemetery with tombs of various periods (many of them 'Villanovan,' and therefore pre-Etruscan), a temple with life-size painted terra-cotta statues of the 6th century B.C., and a rock-cut painted tomb (the Grotta Campana) of a slightly earlier period.

Veiled Prophet. See MOKANNA.

Veins, in Anatomy, if we except the pulmonary, the portal, and the umbilical veins, are the vessels which carry back venous blood from the capillaries, and, enlarging as they proceed, finally pour it through the ascending and descending *venæ cavæ* into the right auricle of the heart; see CIRCULATION. Their coats are similar to those of the arteries, but much thinner, and may be even transparent. They are, however, of considerable strength. The *internal coat* consists of an epithelial layer, supported on several laminæ of longitudinal elastic fibres. The *middle* or *contractile coat* consists of

numerous alternating layers of muscular and elastic fibres, the muscular fibres being disposed circularly round the vessel. The muscular fibres are wanting in some parts of the venous system, and specially developed in others. In the *venæ cavæ* and pulmonary veins near the heart striped muscular fibres may be detected, continuous with those in the auricles. The *external coat* consists of connective or areolar tissue, and of longitudinal elastic fibres; within some of the larger veins, as the inferior *vena cava*, through its whole length, the external iliacs, the azygos, &c., there is also a longitudinal network of unstriped muscular fibres. The existence of valves in the veins is mentioned in the article CIRCULATION. These valves are most numerous in the veins of the extremities, especially the lower limbs, these vessels having to act against the force of gravity more than most others. They are absent in the *venæ cavæ*, the hepatic, portal, renal, pulmonary, and some other large veins, and in very small veins generally. The veins are nourished by nutrient vessels, or *vasa vasorum*, like the arteries; but except in a few instances (including the inferior *vena cava*) nerves are not distributed to them. For the chief diseases of the venous system, see the articles PHLEBITIS, THROMBOSIS, and VARICOSE VEINS.

Veins, in Geology, are crevices or fissures—regular or irregular, and inclined at any angle to the horizon—caused by contraction during consolidation or by mechanical disturbance, and filled up with materials different from the adjacent rocks. Veins occupied by ores and other minerals are termed lodes (see ORE, MINING, GOLD, &c.). These very often occur on lines of fracture (see FAULT). Some veins again, consist of intrusions of Igneous Rock (q.v.). See DYKES, GEOLOGY.

Veit, PHILIPP, painter, was born at Berlin, February 13, 1793. His mother, a daughter of Moses Mendelssohn, had for her second husband Friedrich Schlegel, and Veit became devotedly attached to the religious and artistic ideas of his stepfather, like whom he embraced Catholicism. After finishing his studies at Dresden, he proceeded to Rome in 1815, and became a prominent member of that band of young German painters who sought to infuse into modern art the purity and earnestness of mediæval times. Of all the associates Veit ventured furthest into the obscure realms of symbolism and allegory. His first famous work was the 'Seven Years of Plenty,' executed as a companion-piece to Overbeck's 'Seven Years of Dearth,' and forming part of a series of frescoes illustrative of the history of Joseph, painted at the Villa Bartholdy in Rome. Other pictures of his Roman period are 'The Triumph of Religion' (Vatican), 'Scenes from Dante's *Paradiso*' (Massimi Villa), and an altarpiece, representing 'Mary Queen of Heaven,' in the Trinità de' Monti. These procured him so great a reputation that he was called in 1830 to the directorship of the Art Institute in Frankfort-on-the-Main. While holding this position he produced many grand pictures, of which the most celebrated is the large fresco (at the Institute) representing 'Christianity bringing the Fine Arts to Germany.' In 1843 he removed to Sachsenhausen in Hesse-Cassel, in 1853 to Mainz. He died December 18, 1877.

Veitch, JOHN, LL.D., born at Peebles, October 24, 1829, studied at the university of Edinburgh, and from 1855 to 1860 was assistant to successively Sir William Hamilton and Professor Fraser. He himself became professor of Logic and Rhetoric at St Andrews in 1860, and at Glasgow in 1864. His works include a *Memoir of Sir W. Hamilton* (1869), *Tweed and other Poems* (1875), *History and Poetry of the Scottish Border* (1877; new ed. 1893), *Feeling for Nature in Scottish Poetry* (1887), *Knowing and Being* (1889), *Merlin and other Poems* (1889), *Dualism and Monism*, and *Border Essays* (1896). He died 2d September 1894. See Life by Miss Bryce (1896).

Veitch, WILLIAM, born at Spittal-on-Rule in 1794, qualified at Edinburgh for the Church of Scotland; but finding his true walk in scholarship, he published a text of Cicero's *De Natura*, and *Greek Verbs Irregular and Defective* (1848; 4th ed. 1878), which led to his employment by Liddell and Scott in revising successive editions of their Lexicon. He rendered similar services to Smith's *Latin-English Dictionary*, and to a vast number of school-books and works of reference, classical and theological, generally at the solicitation of their editors, whom he had trenchantly reviewed. In 1866 his Alma Mater gave him her degree of LL.D. A humorist and entertaining *raconteur* to the last, he died in Edinburgh, 8th July 1885.

Velázquez, DIEGO DE SILVA, was born at Seville, 1599, the son of Juan Rodríguez de Silva and Gerónima Velázquez. His father was a cadet of the noble Portuguese family of Silva, but, like Góngora and others, he gave the preference to his mother's name, an old and well-known Seville one. Properly speaking, Velázquez was a self-taught painter. He studied under Herrera 'el Viejo,' a man of marked originality, but of a temper and manners that drove away pupils as fast as his ability attracted them. What Herrera really taught Velázquez was how to teach himself. He used to set his pupils to make *bodegones*, 'cook-shop studies' of meat, fish, loaves, melons, pots and pans, and the like, and thus it was that Velázquez acquired the power that manifests itself in all he did, of seeing what he had to paint and painting what he saw with unerring firmness and truth. His second master was Pacheco, Herrera's opposite in many ways, a feeble, conventional painter, but a man of some culture and refinement, whose greatest merit, perhaps, is that from the first he recognised his pupil's genius, and worshipped it to the last. But Velázquez was only nominally his pupil; he followed his own course of instruction, passing from still-life to life models, the peasant lad whom he hired as a study, or the faces and figures he found in the streets and market-places of Seville. In 1622 he visited Madrid, and was kindly received by his fellow-townsman, Fonseca, by whose advice he returned the next year, bringing with him as a specimen of his work one of his Seville street studies, the famous 'Water-seller,' now in Apsley House, presented by Ferdinand VII. to the Duke of Wellington, who had intercepted it at Vittoria on its way to France in Joseph Bonaparte's carriage. By Fonseca he was introduced to Olivares, and by him presented to the king, who commissioned him to paint his portrait, the first of some forty in which he painted Philip IV. youthful, elderly, on foot, on horseback, hunting, praying, in armour, in velvet, head, bust, half-length, full-length, and made him, so far as paint and canvas could, the best-known monarch in history. The portrait was a complete success, and Velázquez was appointed *pintor de cámara*, with a salary of 20 ducats a month over and above the price paid for his pictures. He was thus at the outset relieved from the necessity of seeking the patronage of the church, and painting altarpieces, martyrdoms, and miracles. Fortune for once sided with genius in his case. Even the course of true love ran smooth with him, for when, in obedience to what seems a law in the lives of painters, he fell in love with his master's daughter, Pacheco, who by all precedent was bound to send him packing, accepted him gladly for a son-in-law. In the

same year (1623) Charles, Prince of Wales, during his hair-brained wooing at Madrid, sat to him for his portrait; and in 1627, by the king's order, he painted 'The Expulsion of the Moriscos' in competition with Caxes, Carducho, and Nardi, the prize being the office of usher of the chamber, which was unhesitatingly awarded to Velázquez by the judges, Mayno and Crescenzi. In 1629 he obtained leave of absence to enable him to improve his acquaintance with Italian art, and spent two years in Venice, Rome, and Naples. On his return fresh honours and emoluments were bestowed upon him, and a studio close to the royal apartments assigned to him, where the king used to spend some hours daily watching the progress of his works. He was in Italy again in 1648–50, this time with a commission from the king to purchase works of art. In 1652 he was appointed Aposentador Mayor, a high dignity, the bestowal of which posterity has had reason to lament, for the duties took him away from his painting-room, and undoubtedly shortened his life. It fell to him, *ex officio*, to direct the arrangements for the marriage of the Infanta with Louis XIV., but more particularly the erection and decoration of the pavilion on the Isle of Pheasants in the Bidasoa, where the ceremony was to take place; and a tertian fever contracted there carried him off, a week after his return to Madrid, 6th August 1660.

Velázquez may be said to have been all but a *pictor ignotus* until the beginning of the 19th century. While the works of other great painters, who painted for churches, monasteries, and uncrowned heads, passed from time to time into the market and were scattered broadcast, his remained for the most part royal property, and only to be seen on palace walls, in the Alcázar of Madrid, the Buen Retiro, the Prado, or the Escorial. To this in a measure they owed their preservation from the military art-collectors of 1808–10, who were bound to respect pictures that belonged to the heritage of Joseph Bonaparte; but doubtless insensibility to their merits was also a protection, for Velázquez offered little temptation to men whose taste had been formed by David. The transfer of the royal pictures to the Museo del Prado at Madrid was virtually a revelation of Velázquez, and it caused his outlying works to be eagerly sought after by collectors of all nationalities. C. B. Curtis reckoned up 274 attributed to him, of which no less than 121 were to be found in the United Kingdom, more than half of them being in London. Beruete, however, recognises only 89 pictures as genuine. In quality as well as quantity Velázquez is well represented in England. Good examples of his early work are to be found in the 'Waterseller' and in the 'Adoration of the Shepherds,' and 'Christ in the House of Martha' (National Gallery), painted under the influence of Ribera and Tristán, before he had settled down to a style of his own; and of his maturer powers in the 'Boar-hunt,' and the portraits of Philip IV. (National Gallery), Innocent X., Philip IV., Olivares, and others elsewhere. The best of all, however, and no doubt the finest Velázquez outside the walls of the Madrid Museo (if it be indeed Velázquez's, for Beruete assigns it to Mazo), is the portrait of Admiral Pulido Pareja in the National Gallery, painted, like most of his greater works, with brushes of a length that enabled him to stand at the distance from which he meant it to be seen, and so to produce effects that Polomino justly calls 'miraculous.' To any one properly placed the story of the king's reprimand addressed to the portrait will not seem incredible. The Rokeby 'Venus' in the National Gallery has also by some been given to Mazo. But it is only at Madrid that Velázquez can be seen in the full variety of his powers, a master in portrait, genre, landscape, animal, and, in fact, every branch of painting except the marine. Philip IV. was too true a lover of art to restrict him to the functions of a court-painter, and Velázquez apparently was allowed a free hand to paint such subjects as took his fancy. His court-pictures, the grand equestrian portraits of the king, Olivares, and the like, are the more conspicuous, but the more characteristic and perhaps more interesting are the portraits of the *truhanes*, jesters, and odd characters that figure in catalogues and guidebooks under arbitrary titles, or else the nicknames of the originals, 'Menippus,' 'Esop,' 'Barbarossa,' &c. These, and his matchless series of dwarfs, were clearly subjects chosen for their own sakes, painted *con amore*, and treated in the spirit of a hidalgo Hogarth. But if he is to be compared to any man it is to his compatriot Cervantes, as an exponent of Spanish realism and Spanish character. It is sometimes said that sacred subjects and female beauty were beyond his reach, and that he could paint nothing that he had not before his eyes. And yet no painter ever painted a more profoundly pathetic Crucifixion than the one in the Prado, or two more charming figures than the 'Meninas' in the marvellous picture named after them, or a more thoroughly dramatic scene than the 'Surrender of Breda,' which might be a scene from a historical play by Shakespeare transferred to canvas.

See Pacheco, *Arte de la Pintura* (1649; reprinted 1866); Palomino, *Museo Pictorico* (1715–24); Head, *Handbook of the Spanish and French Schools of Painting* (1848); Stirling, *Velazquez and his Works* (1855); C. B. Curtis, *Velazquez and Murillo* (1883); Justi, *Velazquez* (in Ger. 1888; trans. 1889); R. A. M. Stevenson, *The Art of Velazquez* (1895); W. Armstrong, *Art of Velazquez* (1896) and *Life* (1896); and books by P. G. Konody (1903), Beruete (trans. 1906), and Bréal (1919).—In France and England the name is usually spelt *Velasquez*.

Velázquez, the Conquistador. See CORTES.

Veldes. See BLED.

Veleia, an ancient Ligurian city, whose ruins, 20 miles S. of Piacenza, were uncovered in 1760–65, and were in very good preservation. The forum and basilica, thermae, amphitheatre, and some private houses were cleared, and the place yielded many Roman antiquities, including statues, inscriptions, coins, &c. The place seems to have been overwhelmed by a landslip about 280 A.D.

Veles (Turk. *Köprülü*) a town of Serbian Macedonia, on the Vardar, 23 miles S.E. of Skoplje.

Vélez-Málaga, a Spanish town 16 miles E. of Málaga, near the mouth of the Vélez, with a Moorish castle and sugar-refineries; pop. (1920) 24,893.

Velleius Paterculus. See PATERCULUS.

Velletri (the ancient *Velitrae*, originally a Volscian stronghold and later the home of the *gens Octavia*, the family to which Augustus belonged), a town of Italy situated on the lower slopes of the outer crater rim of the Alban hills, 26 miles SE. of Rome by rail. It has a cathedral, which is the seat of the cardinal bishop of Ostia (q.v.), the dean of the Sacred College; the lofty campanile of Sta Maria in Trivio, the baroque Palazzo Ginnetti, with a fine staircase by Martino Lunghi, and the municipal palace at the top of the town, commanding a splendid view of the Pomptine Marshes, are also noteworthy. Velletri is the centre of a rich agricultural and wine-growing district (government school of viticulture). Pop. of commune (1921) 25,781.

Vellore, a town of British India, 80 miles W. of Madras by rail, famous for its old fortress

defended for two years by the English against Hyder Ali. Here Tippoo Sahib's family lived till 1806, when, after a bloody mutiny of sepoys, they were transferred to Calcutta. Pop. (1921) 50,210.

Vellozia, a genus of Velloziaceæ, natives of Brazil, Africa, Guiana, and Madagascar, and sometimes called *Tree Lilies*. They are perennials, with trunks closely covered by the withered remains of leaves, branching by forks, and bearing tufts of long, narrow, aloe-like leaves at the extremities of the branches. Some of them are from 2 to 10 feet high, and the trunk is sometimes as thick as a man's body. The structure of the trunk is very remarkable. It has a slender sub-cylindrical central column, of the ordinary monocotyledonous structure, outside of which are arranged great quantities of slender fibrous roots, which cohere firmly by their own cellular surface, and form a spurious kind of wood. The flowers of the larger species are about 6 inches long, pure white, yellow, blue, or purple.

Vellum. See PARCHMENT.

Velocipede. See CYCLING.

Velocity, in its full significance, involves the notion of direction of motion as well as that of speed or rate of motion. The notion of speed is a very familiar one. In measuring it we assume the possibility of measuring space and time; and the unit of speed is that speed which a moving point would need to have in order to pass over the chosen unit of space in a unit of time. Such phrases as four miles per hour, one mile per minute, eighteen miles per second are perfectly intelligible to all who know what a mile, hour, minute, and second are. It should be noted that when we speak of a man walking with a speed of four miles an hour we do not necessarily imply that he really completes four miles, or that he walks for one hour, but only that he would do so were he to keep up that speed for the time named. In fact, speed is an instantaneous property of the moving point. Again, since at every instant the moving point must be moving in a definite direction, as well as with a definite speed, it follows that velocity also is an instantaneous property. If the velocity does not change from instant to instant it is constant, and the point moves in a straight line with constant speed. If the point moves in any other than a straight line, the velocity will be variable even although the speed should remain constant; and the most general change of velocity involves both change of direction and change of speed. Velocity is in fact a vector quantity, and may be treated mathematically as a Vector (q.v.). The rate at which velocity changes is called acceleration. When the velocity changes in direction only, as when a point moves with constant speed in a circle, there is no acceleration in the direction of motion —i.e. parallel to the velocity. The acceleration must therefore be wholly normal to the velocity, and will be towards the centre of the circle in the simple case of uniform circular motion. If any change of speed occurs it is due to an acceleration acting parallel to the velocity, and therefore tangential to the path pursued by the moving point. When only a tangential acceleration exists, the point will move in a straight line with variable speed. A body falling vertically near the earth's surface gives a very good illustration of a pure tangential acceleration. See COMPOSITION, FORCE, HODOGRAPH.

Velvet is one of the most familiar of what are known as pile fabrics. It is a compound textile structure, the ground of which is plain or fine-twill woven. The pile is the result of passing supplementary warp-threads, stitched securely, in the weaving process, into the foundation fabric, over wires. For 'terry' velvet small round wires are employed, but for 'cut' pile, or velvet proper, the wires, on being withdrawn, sever the silk threads under which they are inserted by the loom. In *velveteen*, made in various towns in Yorkshire and Lancashire, the pile is a weft-yarn product, the shuttling shots being duplicated, one group forming the ground, and the second group floating, in regular sequence, on the textural surface. The latter yarns are subsequently cut by machinery. Fustians, corduroys, moleskins, and other cotton pile-goods are obtained by similar looming practices. Some of the rich decorative Italian, French, Flemish, and Spanish textiles of the 15th, 16th, and 17th centuries were partly velvet woven. The pattern features were developed by combining 'terry' and 'cut' effects with ordinary schemes of intertexture—e.g. 'sateen,' 'rep,' and 'twill.' Lyons, St Étienne, and Crefeld are modern centres of velvet manufacture.

Venaissin, an ancient county of France, between the Rhone and the Durance (named from its capital the village of Venasque), now included in Vaucluse.

Vendace (*Coregonus vandesius*), a rare freshwater fish, nearly related to pollan, powan, gwyniad, and other 'whitefish' of the genus Coregonus, which differ from trout and char in their larger scales, in having the mouth small, with the teeth very minute or absent. They are all herring-like in general appearance. The vendace is known only from the Castle Loch and Mill Loch at Lochmaben, where it is imaginatively supposed to have been introduced by Queen Mary. It is about 9 inches

Vendace (*Coregonus vandesius*).

long, is usually greenish-blue above and silvery-white below, swims in shoals, feeds mainly on minute crustaceans, retires in warm weather to deep water, spawns about November. It is esteemed as a delicacy, but very few are now obtainable. There is another Vendace (*Coregonus gracilior*) peculiar to Derwentwater and Bassenthwaite lakes; and both illustrate the origin of distinct species in isolation. Besides British relatives, like pollan and powan, there are other species in the countries around the Baltic, and some migratory species ascend the Siberian rivers from the Arctic Ocean. See C. Tate Regan, *British Freshwater Fishes* (London, 1911).

Vendée, LA, a maritime dept. of western France, bounded on the W. by the Bay of Biscay, on the N. by Loire-Inférieure, and on the S. by Charente-Inférieure. Area, 2690 sq. m.; pop. (1886) 434,808; (1921) 397,292; (1926) 395,602. The dept., which owes its name to a small affluent of the Charente, is traversed from east to west by a range of hills, called in the east the Plateau de Gatin, and in the west the Collines Nantaises, and is watered in the north by the affluents of the Loire, and in the south by the Lay and the affluents of the Charente. Of its three divisions the western is the *Marais*, occupied by salt marshes

and lakes; the northern, the *Bocage*, covered with plantations; in the south and middle is the *Plaine*, an open and fertile tract. The coast-line, 93 miles in length, presents few deep indentations, the chief being the safe Bay of Aiguillon. There are three arrondissements—La Roche-sur-Yon, Fontenay-le-Comte, and Sables-d'Olonne. The capital is La Roche-sur-Yon.—For the obstinate resistance of the Vendeans to the Revolution, and the bloody vengeance of the Republic (1793, 1794–95, 1799, and 1815), see CATHELINEAU, LAROCHEJACQUELEIN, HOCHE, CHOUANS, and Miss Taylor's *Tragedy of an Army* (1913).

Vendémiaire (the 'vintage-month'), the first month in the French Revolution calendar, from 22d September to 21st October. Memorable in the history of the Revolution is the 13th Vendémiaire of the year IV. (5th October 1795), when the Paris Sections, worked upon by royalist reactionaries, rose in insurrection against the National Convention, but were crushed by the historic whiff of grape-shot by Napoleon Bonaparte, then a young artillery officer.

Vendetta, the term used to denote the practice, as it existed till lately in Sicily, Corsica, Sardinia, Calabria, and even in remote districts of Kentucky and other parts of the United States, of individuals taking private vengeance upon those who had shed the blood of their relatives. It was indeed an established institution in primitive society everywhere. Our criminal law is merely a development of a stage of culture when it was every man's right and duty to take the law into his own hands. Bloodshed had to be atoned for by death, and if the actual slayer had escaped his kinsfolk were held responsible for his deeds, and he was punished through vengeance taken upon them. This primitive law of vengeance of blood afforded an elementary means of protection for society, and the fact that the whole family are held responsible brings to bear the full pressure of the family influence to make each of its members keep the peace. The Avenger of Blood is thus a useful functionary, but through ignorance and passion he is prone to err and confound the innocent with the guilty. In the usage of the Israelites we see the method of progress in civilisation—a distinction is made between the wilful and the innocent slayer, and the Cities of Refuge afford the latter a Sanctuary (q.v.). Again we see how the cry for vengeance sinks into a claim for compensation—the blood-money wipes out the blood. Our English forefathers had their *wer-gild* ('man-money'), a money value on each man's life which had to be paid to his kinsmen by the murderer—600 shillings for a thegn, 200 for a ceorl, and naturally less for a Welshman than an Englishman. The law of retaliation—the Roman *lex talionis*—held also for lesser injuries, and was sound morality enough till it was superseded by the higher law of the Gospel. Now the state undertakes the task of punishment, but, as Tylor says, we have still survivals of ancient modes of feeling in such phrases as 'the vengeance of the law,' or the legal form by which a private person is bound over to prosecute as though still suing for his own revenge or compensation. The right of private war between families and tribes long survived in the Borders and the Highlands; but Freeman notes that the battle (1470) between Lord Berkeley and Lord Lisle at Nibley Green in Gloucestershire, in which the latter was slain and Berkeley compounded by a money payment to the widow, was the latest English example either of private war or the payment of the *wer-gild*.

Of all civilised races the vendetta has survived longest among the Italians. In Corsica it was a sacred article of duty, so binding that it needed not the *rimbicco*, the wail of reproach against delay, to spur up the consciences of the next of kin. Here it often happened that its course was complicated by the *vendetta transversale*, when each of two sets of relatives had a murder to avenge on the other. Mérimée's *Colomba* is a striking picture of the intensity with which the imaginations of the Corsican women clung to this form of revenge. See BLOOD (AVENGER OF).

Vendôme, a town of the dept. Loir-et-Cher, on the Loir, 42 miles NNE. of Tours and 111 SW. of Paris by rail. Above it rise the picturesque ruins of the castle of the Dukes of Vendôme, destroyed at the Revolution, and within the town is a splendid Gothic abbey church (13th–15th cent.), with a fine Transition belfry and some interesting choir stalls and stained glass. Gloves and paper are made. Pop. 9000.

Vendôme, an ancient countship of France, erected into a duchy by Francis I., for behoof of Charles de Bourbon, through whom it fell to his grandson, Henry IV., who again conferred it upon César, the eldest of his sons by Gabrielle d'Estrées. César's eldest son, Louis, Duke of Vendôme, married Laura Mancini, one of Mazarin's nieces, and had by her three sons, the eldest of whom was the famous soldier, Louis-Joseph, Duke of Vendôme, called till his father's death the Duc de Penthièvre. He was born at Paris, 1st July 1654, and saw his first service in the Dutch campaign of 1672. He next served with distinction under Turenne in Germany and Alsace, again in the Low Countries under Luxembourg, in Italy under Catinat, and received in 1695 the command of the army in Catalonia. He shook off his indolence, and closed a series of brilliant successes by the capture of Barcelona (1697). After five years of sloth and sensuality he superseded Villeroi in Italy, much to the delight of the soldiers. He fought an undecided battle with Prince Eugene at Luzzara (15th August), then burst into Tirol, returning to Italy to check the united Savoyards and Austrians. On 16th August 1705 he fought a second indecisive battle with Prince Eugene at Cassano, and at Calcinato he crushed the Austrians (19th April 1706). That summer he was recalled to supersede Villeroi in the Low Countries, under nominal command of the Duke of Burgundy. The defeat at Oudenarde (11th July 1708) cost him his command, but in 1710 he was sent to Spain to aid Philip V. His appearance turned the tide of disaster; he brought the king back to Madrid, and defeated the English at Brihuega, and next day the Austrians at Villaviciosa. After a month of gluttony beyond even his wont, he died at Vinaroz in Castellón de la Plana, 11th June 1712. Saint-Simon hated Vendôme, and has gibbeted to all eternity his sloth, his gluttony, and his shameless debauchery.

Vendors. See SALE.

Veneer. Beautifully grained or figured woods are, owing to their cost, rarely used in the form of solid boards, but are cut into thin slices called veneers. These vary in thickness from that of ordinary writing-paper to $\frac{1}{16}$th of an inch and upwards for special purposes. For furniture $\frac{1}{16}$th is a good average thickness. There are 'saw cut' and 'knife cut' veneers, very thin kinds as well as those sliced off in circular fashion from round blocks being always knife cut. The process of veneering consists in simply glueing the veneer to thicker wood, and placing what is then virtually one solid board or panel with the veneer face downwards on a metal table heated with gas. By means of cross bars and screws, above and below the table top, the veneer is held tightly to its backing for two or three hours till the glue is dry

and firm. It will be readily understood that veneering is best done on woods which hold glue well—plain mahogany, American yellow pine, &c.

Ven'ema, HERMANN (1697–1787), divine and professor of Theology at Franeker. Of his numerous works, the *Institutes of Theology* (trans. 1850) is the best known.

Vener, or WENER, LAKE, the largest lake in the Scandinavian peninsula, and after the lakes Ladoga and Onega in Russia the largest in Europe, is situated in the south-west of Sweden, and separated by a comparatively narrow strip of land (nearly 20 miles wide) from the fiords of the Kattegat. It is nearly 100 miles in length, 50 miles in greatest breadth, and 300 feet in greatest depth, and lies 150 feet above sea-level; area about 2150 sq. m. From the north shore a peninsula extends southward into the middle of the lake; and from the southern shore a peninsula extends northward to within about 15 miles of the point of the northern peninsula; the portion of the lake lying to the west of these peninsulas receives the name of Dalbo Lake. Of the numerous rivers that feed the lake the chief is the Klar, from the north, and its surplus waters are discharged into the Kattegat by the river Göta. It is connected by a canal with Lake Vetter, by means of which and the Göta Canal, Lake Roxen, &c., inland communication is established between the Kattegat and the Baltic Sea. The lake is rich in fish; it is often visited by sudden gusts of wind, and is in many places too shallow for navigation. There are many islands.

Venereal Diseases. See GONORRHEA, SYPHILIS.

Venesection. See BLEEDING.

Venetian Style, the type of the Renaissance (q.v.) developed in Venice (see ITALIAN ARCHITECTURE). 'Venetian-Gothic' is a type of Italian Gothic.

Venezélos, ELEUTHERIOS, was born in 1864 at Murniaes, near Canea, Crete, and studied law at Athens. In 1896 he took a prominent part in the Cretan revolt; in 1898, under Prince George of Greece, as High Commissioner of Crete, he became one of the council, and led the Cretan insurrectionary revolt in 1904. Invited to Athens in 1909 by the party of reform, he was in 1910 made president of the council of ministers. His great triumph was the organising of the Balkan alliance, and the remodelling of the Greek army, which enabled it to take a brilliant part in the triumphant campaign of 1912–13. Under him roads were made, shipping greatly increased, and the finances of the country put on a vastly better footing. During the World War, acute differences between Venezélos and King Constantine led to the former (who favoured the Entente) resigning, and in 1916 forming a 'Provisional Government of National Defence' at Salonika (see GREECE, pp. 389, 390). After the deposition of Constantine, Venezélos returned to power in Athens in 1917, and represented Greece at the Peace Conference, but was defeated at the elections of 1920. After three years of voluntary exile abroad, he returned to Greece at the beginning of 1924, and on the establishment of the republic, definitely retired from politics.

Venezia. See VENICE. The regione of Veneto or Venezia is composed of the eight provinces shown in the table at Italy, p. 244: that of Venezia Tridentina of two provinces, Trento and Bolzano; and Venezia Giulia one province, Gorizia.

Venezuela, UNITED STATES OF, a northern republic of South America, between the Caribbean Sea, Colombia, Brazil, and British Guiana. The total area is approximately 363,728 sq. m. Venezuela has figured in a number of boundary disputes. In 1891 the frontier dispute with Colombia was decided by the arbiter Spain in Colombia's favour, and the south-western boundary is now formed by the rivers Arauca, Orinoco, Atabopo, and Negro, while the whole peninsula of Goajira and the town and territory of San Faustino (on the Santander border) belong to Colombia; and in 1880–82 a Venezuelo-Brazilian commission marked off a definite southern frontier. The boundary towards British Guiana was the subject of long controversy, the Venezuelans maintaining their succession to Spanish rights, and Britain the claims taken over in 1814, when Guiana was ceded by Holland. A line surveyed by Sir R. Schomburgk (1839) was put forward in 1841 as a basis of agreement, but rejected by Venezuela; in 1881 Britain modified the line by including additional territory, and in 1890 asserted this as a minimum claim. British subjects having effectively occupied parts of the disputed (gold-bearing) territory, Venezuelan officials encroached on the districts thus occupied; and when President Cleveland's message at the end of 1895 intimated the intervention of the United States, there was the prospect of war between Britain and America. The award of the special arbitration court at Paris (1899) upheld in the main the British claim; the Schomburgk line was departed from only in two places, the lower Barima and the Cuyuni goldfields being assigned to Venezuela. A further arbitration of the Colombian dispute was made in 1922, when the Swiss Confederation upheld the Spanish award of 1891. Trinidad and Tobago islands are British, and Curaçao, Oruba, and Bonaire Dutch.

Venezuela, is a land of mountains and valleys in the west and north, of lower mountains and wooded hills in the south, of llanos between the Orinoco and the northern ranges, and of lake and swamp and forest in the north-west. The Andes enter the country south of Lake Maracaibo, and push north-eastward as the Cordillera de Mérida (16,400 feet) as far as Barquisimeto (190 miles). From this point along the north stretch two more or less parallel coast-ranges. A little farther north a range is distinguished, partly submarine, partly rising in the islands along the coast, partly in the often high and generally rock-bound coast itself. Turning now to the south we find all the country beyond the Orinoco filled with low mountains and, nearer the river, hills, thrown out by the great eastern mountain-system of the continent. Here, above a granitic foundation, rise great masses of red and white sandstones, the most notable Mount Roraima (q.v.), where the frontiers of Guiana, Brazil, and Venezuela meet. Innumerable streams find a way over waterfalls and rapids to the Orinoco, which itself rises amid these mountains, escapes to the west, and then flows north along their edge till they come to an end, when, turned by the volume of the Apure, it swings round to the east and rolls past their northern bounds.

The llanos occupy a fourth of the country, lying between the Orinoco and the northern chains, and are mostly undulating plains of long grass, broken by low plateaus or *mesas*, and by numerous clumps of trees and belts of forest, which are not confined to the banks of streams, but rise out of the savannah. It must be noted, however, that the llanos north of the lower Orinoco, towards Paria peninsula, are dreary and sand-swept, and treeless except along the shallow watercourses. Humboldt saw the llanos bare of aught save grass, and supporting countless herds of cattle; to-day most of the cattle have disappeared, killed off in great part to feed the insurgents in the various civil wars; and as a result the young trees have had a chance to grow. Much of the llanos country is

to all intents and purposes unexplored. The remaining portion of the country, the north-western, around Lake Maracaibo, is rendered almost uninhabitable by its swamps, morasses, and pestiferous climate. Taken as a whole the climate of Venezuela cannot fairly be described as unhealthy. Of course, in a country enclosed between the parallels 2° and 12° N. lat., with the accompanying luxuriant vegetation, tropical fevers must be present; but here the fevers are not so fatal as in Africa, and even yellow fever, though still a scourge, is being coped with to some extent. The climate is moist: the llanos have the rainy season in the summer months, but in the mountains the fall is irregular and at all seasons, losing its tropical character. The temperature varies, of course, with the altitude, from freezing-point above the snow-line to great heat in the coast-towns, the valleys, and the llanos. In the *tierra caliente* (hot region, up to 1700 feet, the limit of the cocoa-nut and cocoa) the yearly mean is from 77° to 86° F., ranging often above 100°; in the *tierra templada* (temperate region, 1700 to 7200 feet, the limit of the banana and sugar-cane) it is from 50° to 77°; and the *tierra fria* (cold region) embraces everything below 50°. There are no active volcanoes in Venezuela, but earthquakes have done great damage at Carácas and elsewhere.

Almost everywhere the country is very abundantly watered, the drainage passing off by eight systems —the Orinoco, the Rio Negro, the Cuyuni, the lakes of Maracaybo and Valencia, the two gulfs on either side of the peninsula of Paria, and the short coast-streams. Vegetation in the tierra caliente is luxuriant often beyond description; the heavy forests are dense with noble trees, and yield gums, balsams, dye-woods, india-rubber, sarsaparilla, cinchona, vanilla, tonka-beans, &c.; tobacco, maize, and cocoa are cultivated. Where water fails in the low-lying valleys cactus forms prevail. In the temperate region coffee is the most valuable product; others are cinchona, sugar, maize, bananas, some cotton, and wheat and barley; these last are grown also in the higher regions, as are peas and beans and much potatoes. But for the most part primitive methods and implements of agriculture are obstinately adhered to. Agriculture suffers, too, in some parts severely, from periodic plagues of locusts.

The fauna is rich in animals and birds peculiar to the tropics, but is of great variety owing to the differences of altitude and temperature. The people are mostly half-breeds—mulattos or mestizos (i.e. of crossed white and Indian blood). Immigration and emigration almost balance one another. Pure negroes or whites are comparatively few; the latter form perhaps 1 per cent. of the population. The blacks are found mostly in the tierra caliente—chiefly on the coast; the survivors of the pure Indian stems are mainly confined to the highest regions, that of the lofty *páramos*, although they are found also in the Maracaibo forests and elsewhere, and in the llanos large villages of nearly pure Indians are met with. The Venezuelans are restless and passionate—least so in the cordillera region—honest and hospitable, universally polite; excessive addiction to alcohol is their most serious failing. The lower orders are almost entirely illiterate, and the upper classes, though cultivated, are lacking in energy, having inherited the Spanish tradition that work is not for gentlemen. The Roman Catholic is the state religion; others are tolerated. There are over 350,000 children in the elementary schools. There are two universities, at Carácas and Mérida; the faculties of law and medicine are the most flourishing. Venezuela occupies a distinguished place in Spanish-American literature. Andrés Bello (1781–1865) is described by Pelayo, the great Spanish critic, as the chief American poet; his *Silva Americana* is reminiscent of Virgil, who was one of his models. Bello, however, spent the greater part of his long life in Chile, where he also distinguished himself as a writer on jurisprudence. Rafael María Baralt (1810–60) was a disciple of Bello, and also wrote in the classical style, which, in his hand, was sometimes frigid. Among living authors, Rufino Blanco Fombona has a high reputation as a poet and novelist, and has written brilliant studies of Venezuelan life. Gonzalo Picón-Febres is an able critic. Altogether the standard of culture in Carácas is high.

Venezuela contains rich mineral deposits, as yet scarcely tapped, except for the Yuruari gold-mines, the Aroa copper-mine, various salt-mines worked by the government, and coal near Barcelona. In the neighbourhood of Lake Maracaibo there are rich springs of petroleum, and coal is abundant here, as well as in the peninsula of Paraguana; and a bituminous plain at the head of the Gulf of Paria separates from the rest of the mainland the so-called 'island' of Brea. In 1924 the production of oil amounted to over 1,300,000 tons, but otherwise the rich mineral resources are almost totally neglected; the amount of gold exported in 1890 was £349,234; in 1900 it had fallen to £63,904, and in 1923 the production of gold amounted only to 390,290 grammes. Manufactures are very backward; chocolate of good quality is made at Carácas, cotton goods are manufactured in Valencia, and matches, cigarettes, and beer are produced in large quantities. About one-fifth of the population is engaged in agriculture. The cattle are estimated to number between four and five millions, besides other live-stock. Trade has advanced within recent years, in spite of the absence or deplorable state of roads in the interior. The first railway was made in 1877; there are now 661 miles of railway in operation, and there are 6244 miles of telegraph line. By far the principal Venezuelan export is coffee, though cocoa, sugar, hides, and asphalt are exported in large quantities. In 1923–4 the imports were £7,179,327, while the exports were £7,263,546. The imports are mainly cotton goods, flour, and machinery. In 1924 Venezuela exported goods to Great Britain valued at £303,913, and imported from that country £1,426,084. The revenue, which is largely derived from customs duties, was £4,759,011 in 1925, and the expenditure was £4,573,829. The tariff is very high. The debt is estimated at £4,447,517, but the history of the foreign debt has been, as was once usual in South America, very unsatisfactory to the bond-holders.

As revolutions used to be frequent, so the constitution has been frequently revised. An important revision was made in 1881, when the size of the states was enlarged and their number reduced. The last revision was effected as lately as 1925. The executive power resides in a president, elected by congress for seven years, who is assisted by cabinet ministers. The legislative authority is vested in congress, which consists of a senate, containing forty members, two for each state, and a chamber of deputies, one member for every 35,000 inhabitants. The army numbers about 10,000 men; the navy is insignificant. The population is estimated at 2,411,952, and has increased very little in the past thirty years. The principal cities are Carácas with 92,000 inhabitants, Maracaibo with 46,000, Valencia, Barquisimeto, San Cristóbal, and Maturín. None of these latter exceed 30,000 in population. The chief ports are La Guayra, Puerto Cabello, Ciudad Bolívar (the port of entry for all southern Venezuela), Maracaibo, and Guanta (opened 1892; 12 miles by rail from Barcelona).

History.—Columbus on his third voyage discovered the Paria coast on 31st July 1498. The

next year the whole Venezuelan coast was skirted by Ojeda and Amerigo Vespucci, and the name 'Little Venice' was given to an Indian village built on piles (as still is common) on the shores of Lake Maracaibo; this is the origin of 'Venezuela,' the name now of the whole country. In 1527 the territory of Coro was pledged by Charles V. to the Welsers of Augsburg, whose governors and adventurers (see HUTTEN, PHILIP VON) had eyes and thoughts only for gold and the fabled El Dorado. In 1558 the crown resumed possession; Carácas was founded in 1567 by Diego de Losada, and in 1578 became the seat of government; the conquistadores penetrated inland in all directions, and settlements were made in many parts. Venezuela figures prominently in the annals of the buccaneers, and in 1595 Carácas was captured by English marauders. The history of the 17th century is uneventful; considerable efforts were made to civilise the Indians by Jesuits and Franciscans. The University of Carácas was founded by Philip V. in 1721, but the good done by the home government was annulled when, three years later, a monopoly was granted to the Compañia Guipuscoana, which caused the utmost discontent among the inhabitants of Venezuela, who were also jealous of the preference given to Spaniards over the native born. The discontent was fomented by Francisco Miranda, who went to Europe to obtain help against Spain. At last, in 1810 the revolution began which ended in the independence of the country, and the withdrawal of the royal forces in 1821 (see BOLÍVAR). Venezuela was united with Colombia (q.v.) and Ecuador; but these states soon fell away, and Venezuela was left to enjoy some years of comparative rest until 1847. Then followed twenty-three years of struggle between the 'Yellows' and 'Blues,' or Liberals and Conservatives, 1866–70 being terrible for the bloody *guerra de cinco años*, which left the llanos ruined for years and the country's credit destroyed. From 1870 to 1877 the 'Illustrious American,' General Guzmán Blanco, was first dictator and then president, and did much to rescue the country from its embarrassments, resuming the service of the foreign debt, and patching up a quarrel with the Netherlands that had arisen over the old habit of smuggling. Again he held the reins of power in 1879–84 and in 1886–87; but actually he was dictator from 1870 to 1889, other presidents being merely figure-heads appointed by himself. The dictatorship of Blanco was undoubtedly beneficial to the country. Although he amassed a vast fortune by various corrupt practices, he kept the country at peace, built 500 miles of railway, and gave the republic the blessing of a stable currency, which it still enjoys. However, the people at last tired of his paternal rule, and his place was taken by General Palazio. A period of confusion and civil strife followed, and in 1899 the notorious Castro came to the front and in 1902 was elected president-dictator for six years. His reign, however, was considerably shorter than that of Blanco, for he became embroiled with various foreign powers, and particularly with England and Germany. Having many claims for pecuniary damage and complaints of violent acts, Germany and England in the winter of 1902–3 seized the Venezuelan fleet, bombarded the customs house, and blockaded the coast. Eventually, through the mediation of the United States, the claims were submitted to arbitration. This affair was of permanent importance, for it led to the affirmation of the Drago doctrine, which was accepted by the Hague conference of 1907, the substance of which is that force must not be used for the recovery of ordinary public debts originating in contracts. In 1905 Castro was elected as a constitutional president for six years. However, in 1908 he had a serious quarrel with Holland, and the Dutch fleet took active steps to gain redress for injuries done. This led to his flight from the country, and all his efforts to recover his authority were unsuccessful. Since that time Venezuela has enjoyed peace and prosperity, while its financial credit is much stronger than ever before. As noted, the constitution was revised in 1925, but this was done peacefully, and the republic has long enjoyed freedom from revolutions. The president, Juan Vicente Gómez, who was elected in 1922, has done much to develop the resources of Venezuela.

See M. Tejera, *Venezuela Pintoresca* (Paris, 1875); Jeuns de Tallenay, *Souvenirs de Vénézuéla* (Paris, 1884); Oviedo y Banos, *Historia* (ed. of 1885, Paris); Paul de Cazeneuve and F. Haraine, *Les États-Unis de Vénézuéla* (Paris, 1888); W. E. Curtis, *A Land where it is always Sunshine* (1896); W. L. Scruggs, *The Colombian and Venezuelan Republics* (1905); G. Picón-Febres, *La Literatura Venezolana* (Carácas, 1906); L. V. Dalton, *Venezuela* (1912); also *Venezuela 1924: Geographic Sketch* (Carácas, 1924).

Venice (Ital. *Venezia*), the 'Pearl' or 'Queen' of the Adriatic. In the 5th century the Veneti, expelled by Lombards and Goths from Padua, Altinum, and Aquileia, found refuge in the islands of the lagoons, making Malamocco their chief port and their seat of government, afterwards (9th century) transferred to Rivo-Alto, the nucleus of Venice. Tradition places its first buildings on the site of the Basilica of St Mark, and these now cover a hundred and seventeen islets, or rather mud-banks, their foundations being piles ('time-petrified') and stone. Through its two unequal portions winds for

over 2 miles the Grand Canal (Canalazzo), spanned by the Rialto bridge (of stone) and two others (of iron), and from its outer rim flow into the Canalazzo 146 lesser canals, all bridged at frequent intervals. This vast network of waterway is patrolled by countless gondolas ('the hansom-cab of the Adriatic'), while the pedestrian has his choice of innumerable lanes (*calli*), making every house accessible sooner or later on foot. A railway viaduct (1845) 2⅛ miles long connects Venice with the mainland, it being 165 miles E. of Milan, 71 ENE. of Mantua, and 181 NNE. of Florence. Its population, from well-nigh 200,000 in the 15th century, dwindled to 96,000 in 1797, but increased to 151,840 in 1901, 171,665 in 1921, speaking a dialect differing from the

more masculine Tuscan in eliding the consonants and running the vowel-syllables into one, *figlio*, for example, becoming *fio*, and *casa cà*. Its industries are its famous glass manufacture; jewellery and embroidery in gold and silver; wood and metal work; cotton, lace, velvets, and silks; candles of wax and spermaceti; soap, sugar, and confectionery. Printing, once its most honourable tradition, is now reviving. The ship and boat building required for its fishing and pilot-service was, after its restoration to Italy, supplemented by ironclads, of which several first-class specimens left its arsenal. Matters have, however, been altered somewhat since the Great War, large ships no longer forming part of the Italian naval programme. As a commercial port Venice comes next after Trieste at present; but a large new harbour was begun in 1919 near Fort Malghera, on the mainland, which is to be able to deal with over 10 million tons of goods per annum, and connected with the railway system. It is to cover twice the area of Venice itself when completed. Various industrial establishments, shipyards, &c., have been or will be built in the vicinity, as well as a large garden suburb. The alluvial discharge into its gulf has greatly and irregularly reduced its depth of water, its lagoon looking at low ebb (the tidal variation being between 2 and 3 feet) like so many acres of mud. The lagoon is connected with the sea by four entrances, of which the Lido and Malamocco are the most important. Measured even by Italian death-rates Venice is not healthy, but with the drinking-water now supplied from the mainland it is improving. Its prelate still bears the proud title of patriarch.

Detailed reference to all its attractions, architectural, artistic, and historical, belongs to the guide-book, but Venice possesses features distinctive enough for brief notice here. Such are its Piazza di S. Marco, the north side formed by the Procuratie Vecchie, surmounting an arcade of fifty arches re-erected in 1517–38, as the residence of the nine procurators of St Mark, from whom the doge was usually elected. For the increasing number of these dignitaries were built the Procuratie Nuove, on the south side of the Piazza, now constituting a portion of the Palazzo Reale, to which the Museo Civico has been transferred. Of this the library hall is a masterpiece of Sansovino, its ceiling decorated by the seven best Venetian artists of the time (1582), while Titian, Paul Veronese, Bassano, and Tintoretto contributed splended work to other parts of the interior. The historic and characteristic campanile of 323 feet (begun in 888, or 911 or 913 according to others; belfry completed about 1512) collapsed in July 1902, but was rebuilt in 1903–12, on the sound old foundation. The clock-tower gives entrance to the Merceria or main business quarter, threaded by streets converging towards the Rialto. In front of St Mark's itself rise three red flagstaffs, surmounted by winged lions. From these once floated the silk and gold banners typifying Candia, Cyprus, and the Morea, the three possessions of the republic, now replaced on festas by the flag of Italy. Only less supreme in interest than the Basilica of St Mark is the Doge's Palace, which, dating from the 10th and 11th centuries, has been extended, modified, and restored. Successive conflagrations have destroyed the paintings by the Bellinis, Carpaccio, Pordenone, and Titian, which ennobled its vast chambers, but its outer shell, particularly the east aspect towards the Bridge of Sighs, commands universal admiration. Ruskin's *Stones of Venice* has familiarised the world with the beauty of its details, its columns with their capitals particularly; but from these and the Porta della Carta of the main entrance, the Scala dei Giganti, and the Scala d'Oro, we must hasten if only to give a glance at the Sala del Maggior Consiglio, and at what remains of the vivid and impressive touch of Titian, Bassano, Tintoretto, Paolo Veronese, and Palma Giovane, who lavished their genius on its walls. The celebrated Biblioteca di San Marco, transferred (1817) from the above-described library hall of the Palazzo Reale, contains 400,000 volumes and 13,000 MSS.—the latter at one time including the codex of Homer, bequeathed by Petrarch, who had received it from Nicolaos Sigeros, ambassador from the Greek emperor, but since destroyed with all the others of Petrarch's bequest. The Museo Archeologico, also shorn of much treasure, among it the maps of those countries explored by Venetian travellers, and originally drawn by the great geographer Gian Battista Ramusio (1485–1557), still repays many a visit, if only for its Mappamondo in which the Camaldolese monk Mauro embodied a geographical encyclopædia of the information accessible up to 1459. Other rooms, the Sala della Bussola (antechamber to the Council of Ten), the Sala del Consiglio dei Dieci itself, the Sala del Senato, and the Sala del Collegio (to mention the more famous of them), have each their special associations and attractions historical or artistic, the interest deepening as we mount to the Sotto Piombi ('under the leads') where Casanova and Silvio Pellico languished, or descend to the Pozzi ('wells') which shadow many a page of Venetian history, or emerge from the Doge's Palace to cross the Bridge of Sighs and enter the Carceri or public prisons, sombre as their destination and their records. The Zecca or Mint (now the Bourse) and the granite columns, one bearing the Lion of St Mark, the other St Theodore, have infinitely less to detain us than the Basilica di S. Marco itself, placed by Canova above the cathedrals of Pisa and Siena as, on the whole, the first of the three finest churches in Italy. Signor Ongania's magnificent folio, *La Basilica di San Marco Esposta* (1883), does not suffice to exhaust the interest surrounding and pervading this wonderful edifice, of which the external mosaics, the bronze horses, the interior (also ennobled by its mosaics), the choir, the sacristy, the north transept, the baptistery, the treasury, and the pavement have each their special students and art-votaries, whose admiration a life-long succession of visits seems only to deepen and refine. Dwarfed by comparison, the remaining churches of Venice, formerly more numerous than the Roman ones in proportion to population, need now be noticed only in groups, of which there are four—the first, Gothic in style, exemplified in the plain, massive, and solemn church of the Frari; the second, the so-called Lombard (really a revival of the 15th-century Romanesque), of which the church of the Miracoli is the type; the third, the Italian, locally termed 'classical,' seen at its best in the Palladian Redentore; and the fourth, or modern Italian, ornate to excess, represented by the church of the Salute. Many of these are individually attractive, over and above their history or destination, by artistic *chefs d'œuvre;* the fine Gothic brick church of SS. Giovanni e Paolo was long famous for its masterpiece by Titian (the 'Death of Peter Martyr'), destroyed by fire in 1867, and replaced by an old copy; and still is for its neighbouring statue of Bartolommeo Colleoni, general of the republic (1475), which, designed by Verrocchio and cast by Leopardi, is reckoned the finest art-product of its kind in the world (though perhaps the decorations on the horse's harness are too elaborate), but that of Gattamelata at Padua, by Donatello, runs it close. During the Great War the two statues were laid for safety side by side in a low-roofed cellar of the Palazzo Venezia in Rome. The church of

San Rocco has also a reflected interest from its Scuola hard by, rich in magnificent Tintorettos.

To the museums and picture-galleries, which, as in times past, will always attract the student of painting, we can do even less justice than to the public buildings and churches—the interest of the former consisting in a wealth of *chefs d'œuvre*, around which a whole library of criticism and controversy has for more than a century accumulated. The Accademia delle Belle Arti is famous for its Bellinis (Gentile and Giovanni), its Carpaccios, its Giorgiones, its Palmas (Vecchio and Giovane), its Paolo Veroneses, its Tintorettos, and its Titians; while the Museo Civico, infinitely less attractive in painting, never fails to reward the visits of the lover of majolicas, gems, carvings, autographs, miniatures, and other rarities bequeathed to the city in 1830 by Teodoro Correr. Interest of a sterner kind clings to the arsenal, founded in 1104, busy with 16,000 artisans in the 16th century to maintain the supremacy of the republic afloat, and still a leading dockyard for Italy. Its museum forms a running commentary on Venetian history, containing the model of the Bucentaur (q.v.) from which the doge every Ascension Day solemnly espoused the Adriatic. From the arsenal to the Grand Canal, with its rows of palaces on either side, we return to artistic Venice, the palaces themselves, notably the Palazzo Manzoni (15th century), the Palazzo Corner (16th century), the Palazzo Rezzonico, the Palazzo Foscari, the Palazzo Pisani a S. Polo, the Palazzo Contarini, followed by the three Mocenigo palaces (the centre one occupied by Lord Byron), the Palazzo Corner Spinelli, and the Palazzo Grimani, down to the Rialto Bridge (beyond which are the Palazzo Camerlenghi, then the famous Ca' d'Oro, and the Palazzo Vendramin Calerghi), all recommended in divers ways for their architectural beauty, their interior arrangement and ornamentation, and their family associations closely linked with the fortunes of the republic. Other palaces of repute are the Palazzo Giovanelli, with its far-famed landscape, with a storm scene (perhaps representing the meeting of Adrastus and Hypsipyle while the latter was acting as a nurse with the king of Nemea) by Giorgione; the Palazzo Trevisan; and the Palazzo Moro, the abode (according to tradition, in this case none too well founded) of Shakespeare's Othello. In theatres Venice is comparatively poor, La Fenice being the principal one; but in public gardens and islets adapted for holiday purposes it abounds. The Littorale di Malamocco, facing the city across the lagoon (the so-called 'Lido'), is an immensely popular resort, particularly during the bathing season, when it presents a very different aspect from the lonely haunted-looking strand so dear to the misanthropic mood of Byron. This and the islets of Murano (q.v., renowned for its glass), Torcello (with its two Byzantine churches), and Burano (q.v., employing many girls in the celebrated lace-industry) are easily accessible by the steamers and steam- and motor-launches which, the latter especially, seem likely to replace the picturesque but much slower gondola, not only in the Adriatic but within the city itself.

History.—Venice rises to historical importance in 697 A.D. when its island-communities, governed for 240 years by annually elected tribunes, superseded these at the instance of Cristoforo, patriarch of Grado, by a Duke or Doge of absolute authority in church and state, during peace and war. Paolo Lucio Anafesto, first of the long line of doges, ruled the republic with power and wisdom, suppressing faction, and acquiring from the Lombards a foothold on the mainland. Orso, the third doge (720–37), gained further advantages over the Lombards, whom he compelled to reinstate the Exarch of Ravenna, for which service the Byzantine emperor honoured him with the title of Ipato (Hypatos) or imperial consul. Gravitating through political interest to Constantinople, Venice opposed the policy of France in the Adriatic and incurred the enmity of Pepin, whose fleet blockaded the Venetians in the central island (Rialto). But the ebbing tide left the invaders stranded off the islet of Albiola, where the light flotilla of Venice annihilated them. From the Rialto, now (810) the seat of government, the Doge Agnello Partecipazio ruled all the neighbouring islets, connecting them with bridges, and forming the modern Venice. Having acquired the relics of St. Mark (827), the Doge Giovanni I. Partecipazio made the evangelist the tutelary saint of Venice, and began (829) the building of his cathedral. A long interval of comparative peace favoured the maritime and mercantile expansion of the city. Istria and Dalmatia were conquered, while commercial relations were opened up with the west and still more with the east as far as the Crimea and Tartary, and made Venice a dominant power in the Levant and one of the leaders of the crusades. Ostensibly religious, but really commercial, this latter enterprise of the Venetians left them stronger in the Mediterranean than ever. Meanwhile the city itself, reduced to ashes by successive conflagrations, replaced its wooden by stone edifices, in which marble from Italian and Dalmatian quarries figured largely, and laid the foundation of those palaces which have ever since been one of its characteristic features. Extended relations abroad provoked inevitable wars. The crusades of the Doge Faliero and of his successor Domenico Michele riveted the power of Venice in Syria by the reduction of Tyre, and eventually brought the republic into collision with the Byzantine emperor Joannes Comnenus, who decreed the suspension of all intercourse between the two powers. Resorting to swift reprisals, Venice next year (1123) punished the empire by the capture of Rhodes, besieged or sacked the Cyclades, Sporades, and Ionian islands with part of the Morea, and once more reduced Dalmatia, instigated by the Hungarian king to revolt. Siding first with the German emperor and then with the pope, the republic witnessed the meeting of the two (Frederick I. and Alexander III.) within its walls, and was confirmed by the latter in its eternal dominion of the sea. This triumphant policy, diplomatic and strategic, was the work of the Doge Ziani (1172–78), who also improved the city by laying out the Piazza di S. Marco. Enrico Dandolo (q.v.) reduced Trieste, reconquered Zara, and headed the fourth crusade, nominally for Palestine, really against Constantinople, which he stormed. He thus brought about the partition of the Greco-Latin empire, of which Venice received the lion's share—a large slice of Greece and its islands, with a foothold in the Balkan Peninsula, on the Hellespont, and in Constantinople itself, of which a fourth part was reserved for Venetian occupation, protected by Venetian laws and absolutely unrestricted as to trade. To this period belongs the embellishment of the city with the art-treasures of the east—its palaces receiving the care which a territorial aristocracy bestows on its lands, and employing a new and noble school of artists to celebrate the triumphs of the doges.

Under the second Ziani (1205–29) arose the hostilities with Genoa, culminating in the ten years' naval war in which Dandolo succumbed to Doria, and Venice, shattered at sea, witnessed the re-occupation of Constantinople by Michael Palæologus, with whom the republic had to make truce. The abolition of the old laws regulating the election of the doge caused the conversion of the republic into an aristocratic oligarchy (1297),

whose malgovernment led to conspiracies, the most formidable being that of Quirini-Tiepolo (1310), which proved abortive, but gave direct occasion to reforms. Among these was the establishment of the Council of Ten, declared a permanent body in 1335. The mercantile prosperity of this period was reflected in the ornamentation of the city, and an enlargement of the arsenal, whence Francesco Dandolo sailed against the Turks; while Marco Polo (1259–1324) was the first of the famous Venetian navigators and explorers. Andrea Dandolo put down revolt in Candia and Zara, though this was supported by Hungary. The latter doge's great capacity as a thinker and man of letters appears in his *Venetian Annals*—a model of mediæval history. In 1348 an earthquake upheaved the lagoon, and a seven months' pestilence ensued—the flood and the disease destroying two-fifths of the population and fifty patrician families. To the memorable conspiracy headed by the Doge Marino Faliero (q.v.) the 14th century owes much of its interest, enhanced by the commercial rivalry between Genoa and Venice which culminated in naval battles alternately in favour of either side, till Genoa followed up its latest advantage by seizing the island of Chioggia (1379). Venice in turn became the aggressor, starved the Genoese to the point of surrender, and accepted from them an unconditional capitulation (1380). Sixteen years thereafter Genoa became the dependant of France, and was no longer the effective rival of Venice, which in consequence reassumed its supremacy at sea in war and merchandise, trading with every European country, and with the east as far as India, importing from England the iron of Staffordshire, the tin of Cornwall and Devonshire, and the wool of Sussex. The close of the 14th and beginning of the 15th century saw the Venetian arms triumphant on the Italian mainland, till under the Doge Francesco Foscari (1423–57) the long war with Milan was concluded by a peace, and a league of the Italian states was formed (1454) for the mutual safeguard of their possessions. The latter half of the 15th century was chiefly occupied with hostilities against the aggressive Turks, with inter-Italian broils in which petty duke and sovereign pontiff figure, now as enemies, now as allies of Venice, and with a war with France closed by treaty (1499).

The 16th century opens with the oligarchy at the zenith of its power, but this was of short duration. The discovery of America and of a passage to the East Indies began to tell upon its trade, and the constant drain of wars, local and imperial, was not met by the diminished revenue from abroad. Incessant collisions on a great as on a small scale brought about by the League of Cambrai impaired commerce and industry, necessitating an undecided policy between the great belligerents Charles V. and Francis I., and an unprofitable neutrality in the religious agitations of Europe. In the 17th century the pressure of Austria became such as to force the oligarchy to side with the enemies of that power—with Henry IV. of France, with Bethlen Gabor and Rákóczy, with the Duke of Savoy against Spain, and with the Protestants against the Catholics of the Grisons. In 1644 began the twenty-five years' war in Candia, in which the Venetian admirals defeated the Turks in a succession of mighty engagements, resulting in successes in Greece and Illyricum in which the highest name is that of the Doge Francesco Morosini, who, after heading his fleet triumphantly for the third time, died at Nauplia (1694). Neutral in the war of the Spanish succession, Venice became again embroiled with Turkey, and lost the Morea and its hold on Candia (1718). Gradual decay marks its subsequent history: its policy became feebler throughout the 18th century, its commerce had sunk irretrievably; so that in 1796 Napoleon found nothing but the shadow of its former self on his invasion of the city. By the shameful treaty of Campoformio the last doge, Lodovico Manin, resigned and the Austrians became its masters (1797), and again by the Congress of Vienna re-occupied it in compensation for the Belgian provinces. Its revolt of 1848 and heroic defence by Daniel Manin led up to its final cession (1866) to Napoleon III., who handed it over to Victor Emmanuel—the last state but one to become absorbed in united Italy. Venice suffered from aerial bombardment in the World War; but no damage was done to any building of first-rate importance.

See, besides works already cited, books by C. Yriarte (Eng. trans. 1879), Daru (4th ed. Paris, 9 vols. 1853), A. J. C. Hare (1884; 5th ed. 1901), Howells (new ed. 1885), H. F. Brown (1887–93), Mrs Oliphant (1887), Carew Hazlitt (new ed. 1915), Alethea Wiel (1894), Molinier (Paris, 1891), Balten and Geuter (Linz, 1895), Molmenti (Florence, 1897; trans. 1906–8), Okey (1903), and Menpes (1904). See also the articles ALDINE EDITIONS, CONTARINI, CORNARO, DANDOLO, FALIERO, MANIN, SARPI, TINTORETTO, TITIAN, and PAINTING.

Veni Creator Spiritus, an ancient and celebrated hymn of the Roman Breviary, which occurs in the offices of the Feast of Pentecost for Vespers and Tierce, and in the Pontifical for the Ordination of Priests, Consecration of Bishops or of a Church, the 'Ordo ad Synodum,' and some other solemn services. On the authority of Ekkehard's life (*c.* 1220) of Notker, it was ascribed to Charlemagne or to Charles the Bald; but its correct classical metre and diction bespeak an earlier age, and some credited it to St Ambrose, Gregory the Great, or Hrabanus Maurus. It was translated by Dryden, whose version was adapted by John Wesley and Toplady—not to speak of many later translators. The Veni Creator Spiritus must not be confounded with the Veni Sancte Spiritus, the 'Golden Sequence,' which belongs not to the Breviary, but to the Missal. In five stanzas, each of six lines of seven-syllable trochaic verse, it is certainly not older than the beginning of the 13th century. It has been ascribed to King Robert II. of France, to Stephen Langton, to Pope Innocent III. and others. Good translations are by Caswall and by Neale.

Venlo, a Dutch town on the Maas, close to the German frontier, 20 miles W. of Crefeld, is an important railway centre, with manufactures of needles, cigars, and gin. The fortifications that had some ten times endured siege and capture were removed in 1868. Pop. 22,000.

Venn, HENRY (1724–97), an eminent English evangelical, was born of a clerical family at Barnes in Surrey, studied at Jesus College, Cambridge, became Fellow of Queen's College in 1749, and was vicar of Huddersfield (1759–71), and then of Yelling in Huntingdonshire. He was an indefatigable preacher, often delivering as many as ten sermons a week. His two books were *The Complete Duty of Man* (1763) and *Mistakes in Religion* (1774).

See his Memoir and *Correspondence* (1834), and the study by W. Knight (1881).

Venomous Bites and Stings. The most important group, snake-bites, the poison, and the antidote, have been already treated at SNAKES. Others will be found dealt with under the heads of the creatures that inflict them—as at SCORPION, BEE, ANT, HORNET, WASP, TARANTULA, &c. The number of insects directly poisonous is few; in ants, bees, and wasps there is real venom (formic acid); but many injurious insects annoy otherwise than by injecting their own poison (see BOT). The pain of the mosquito bite is probably due to the

sawing motion of the proboscis. But any biting insect may, if it have touched a festering carcass, carry and inject a deadly poison not its own, or, as in Malaria (q.v.), Sleeping-sickness (q.v.), and Yellow Fever (q.v.), convey the germs of fatal or harmful (bacterial or protozoan) parasites. See POISON, STINGING-CELLS, WOUND.

Venosa, a town of Southern Italy, 25 miles N. of Potenza direct, with a station on the railway between Rocchetta S. Antonio and Spinazzola. It was the ancient *Venusia*, situated on a plateau between two deep ravines, and in 291 B.C. a military colony with 20,000 men was founded here, the Via Appia having been prolonged thus far. Later it was the birthplace of the poet Horace. Roman remains are very scanty (though there is a Jewish catacomb of the 4th and 5th centuries A.D.); but blocks of stone from the amphitheatre and from numerous tombs (as the inscriptions on them show) were used in the construction of the church and abbey of the SS. Trinità, begun in 1059. Pop. 9000.

Ventilation, artificial renewal of the air within a confined space, such as a mine or the interior of a building or vessel. This is required when the air is subject to contamination, as by products of respiration or by admixture with other gases. In a mine it is necessary to renew the air in order to carry off the products of respiration of men and horses, the products of combustion of lamps, and, in coal-mines, the inflammable gas which oozes from coal or rushes from 'blowers,' and causes risk of explosions. In general there are two leading methods of ventilation: (*a*) causing air to go out at the outlet, and allowing air to find its way in by any inlet (*vacuum method*); (*b*) forcing air in and allowing it to find its way out (*plenum method*). The advantage of the second method is that it is known whence the air comes which is forced in, and the access of air from other sources tends to be prevented by the excess of pressure within the confined space. In most cases, however, the vacuum method is much more easily applied.

In mines there are two main methods of applying the vacuum method: (*a*) by a furnace at the bottom of the upcast shaft; (*b*) by a vacuum fan at the top of that shaft. In both cases the actual quantity of air which is caused to travel up the upcast shaft must be sufficient to sweep away and sufficiently dilute all the mischievous admixtures in the workings; and the 'draught' must be sufficient to overcome the very considerable friction encountered by the air as it passes through the air-ways. This friction varies at each spot as the square of the velocity there; and therefore it is necessary to arrange the air-ways so as, with a given flow, to have the least velocity possible upon discharge into the outer air. When a furnace is used, the hot air, products of combustion, and smoke from it are lighter than the surrounding air—i.e. that in the workings; the heavier air in the workings tends, under the action of gravity, to go under and to buoy up the hot gases, which therefore ascend in the upcast shaft. This being continuous there is a continuous flow of air from the workings, maintained by a continuous flow of fresh air down the downcast shaft. A furnace is, however, somewhat dangerous, for the air from the workings may, upon reaching it, be unsafely charged with gas and coal-dust; and during recent years powerful exhaust fans, like centrifugal pumps (see PUMPS), have been largely employed. The velocity for a given flow is lowest when the air-ways are wide, and the velocity at any point of the workings is less the more numerous the air-ways. The flow through the workings is regulated by opening and closing air-doors or putting up barriers. If the flow through the workings is too much obstructed, the actual outflow of air being maintained by driving the engine hard, the pressure within the air-ways may be so far diminished that gas is exhausted from the coal-seam. In mines water-gauges are employed in order to test the local pressures in the workings; one limb of a U-tube containing a little water is connected with the 'dumb-drift,' and thereby with the upcast shaft; the other limb is open to the air-way; the movement of the water in the U-tube, taken along with the readings of the instruments in the upcast-shaft, indicates the suctional variations of pressure in the workings. The velocity is measured by anemometers, which are often made to signal their readings by electric transmission. Barometers and thermometers are also used in order to supply data for the requisite corrections and adjustment of quantity of air to be set in motion. Besides furnaces and fans, steam and air-blasts have been used in order to force air along; but these waste much power. In ore-mining the fresh and chilled air liberated from compressed-air motors at the working face is often very useful as a means of ventilation by the plenum method at the very point where air is most needed.

In regard to buildings and dwellings the greater care now taken in making doors and windows air-tight makes it more necessary than it formerly was to provide proper means of removing vitiated air and supplying fresh. In the old House of Commons Sir Christopher Wren made the chamber communicate by means of tubes with an upper room into which the heated air went while the cold air from that room flowed down; this produced draughts. In 1723 Dr Desaguliers lit fires in the upper room; these fires heated the ventilating tubes from the chamber below, and caused air to ascend in them. He afterwards used a centrifugal blowing wheel, turned by a man, to effect the same purpose. Before 1744 Dr Stephen Hales proposed to use bellows for driving air into a room or a ship, or for expelling it; these being sometimes worked by a roof windmill. In 1749 Mr Samuel Sutton proposed the simple use of an open fire, the air-supply of which is wholly drawn from the interior of a building or the hold of a ship. Count Rumford proposed to take the air-supply of a building down from the roof by means of an air-shaft; a plan which implied that the fire must be kept burning, and extraneous air excluded. In 1811, at the House of Lords, Sir Humphry Davy admitted air, heated if necessary, by numerous apertures in the floor, and used Dr Desaguliers' mode of extraction, but his exit-pipes were too small, and the plan failed. About 1818 the Marquis de Chabannes wrote upon the ventilation of rooms. He proposed the admission of air by tubes heated by the fire, open to the outer air at one end and to the room at the other; and he proposed a chimney ventilator to remove the vitiated air, and also ventilating lamps and ventilating gas-fittings to carry off not only the products of their own combustion, but also an additional quantity of air, through special channels. In the House of Commons he applied steam-heat near the ceiling to warm the air and produce ascending currents. In 1834 Dr Reid of Edinburgh introduced, at the temporary House of Commons built after the fire, the principle of a much larger exit area than had previously been thought necessary. The vitiated air was drawn through a furnace and up a high chimney. There were very numerous apertures of admission for the air, which was filtered from dust, and warmed or cooled, dried or moistened, as might be required. The temperature was regulated by mixing highly heated air with an adjustable quantity of cold air in a mixing and equalising

chamber before allowing the mixture to enter the House. Mr Gurney, in the new buildings, made the windows capable of being opened, introduced steam-heating, and took in the air at a low level instead of from the top of a tower as Dr Reid had done at first.

The ascent of heated air and products of combustion up a chimney and the consequent outflow of air from the room requires that the pressure in the chimney shall be less than that in the room. This is ordinarily provided for on the gravity principle mentioned under the mine-furnace; but it may be disturbed, through the gases being chilled by a cold chimney so that they become even heavier than air, or through wind pressing upon the upper outlet of the chimney, or through wind sweeping past the window and creating a partial vacuum in the room; in which cases we have a back-draught down the chimney.

The products of combustion and respiration, comprising carbonic acid, water-vapour, and a small quantity of anthropotoxin (which is a virulent poison when concentrated), are rapidly diffused throughout the air of a room; and more air ought to enter a room, in order to dilute these, than is actually necessary in order to supply the requisite oxygen. The quantity of air required per head per minute has been very variously stated; the figure now usually stated is between 20 and 30 cubic feet per head per minute. The inflowing air should never be allowed to make sharp draughts across a room; for this reason it is frequently much safer to open a window widely than it is to open it a little; but the inflowing stream may be broken up so as to diminish its velocity as far as is consistent with adequate flow. For this purpose perforated zinc, perforated glass, wire gauze, sliding valves, air-bricks, and similar devices may be used; or the velocity may be practically diminished by directing the incoming stream of air towards the ceiling as by louvre ventilators in the window, or by Tobin's tubes. In these, when there is any withdrawal of air from the room, its place is taken by air directed in an upward stream through tubes whose upper end is open at a height of about 6 feet within the room, while the other end is open to the external air-supply at a lower level. In Sir Douglas Galton's grate there is an air-chamber behind the fire, which is continued into an air-flue above. The air-chamber is connected with the outer air; air is heated in the chamber and flue, and leaves the flue, passing into the room near the ceiling; fresh air enters the chamber from outside, and a continuous supply is thus kept up; warm air enters the room, and cold draughts are prevented. In Pierce's stove air from outside flows round the fire within an open stove; it enters the room through a perforated grating at the top, ascends to the ceiling and circulates there. There is still a good deal of divergence of opinion as to whether air should be admitted at the top or the bottom of an apartment. Neither method is entirely free from objection. Cold air admitted at a low level never allows the lower part of the room to become warm; this might, however, be an advantage in sultry weather. Cold air admitted at a high level brings the products of combustion down to be breathed over again. Mr Dye argued in favour of bringing in fresh air, if cold, at an intermediate height, just above people's heads.

For extraction of the vitiated air the open fireplace is to some extent effective even in summer time, for the chimney long remains slightly warm; but the current of vitiated air is better directed, not past the persons in the room, but towards the ceiling, and taken off by a grating opening into the chimney. When this is done down-draughts must be checked by a valve, the fireplace must not be too wide or open, and the chimney itself must not be too narrow. The fault of an open fireplace is in general that when the fire is lit it extracts more air than it is necessary to extract for ventilation purposes, and the air-supply must come in partly through the house or down some other chimney, or may fail to find its way in at all, in which case the chimney smokes. During recent years a great deal of attention has been paid to utilising the motive power of gas-flames and gas-fires (the invisible products of combustion from which ought not to enter or at any rate remain in the room) as a means of ventilation. The guiding principle here is that the burners should be in no way subject to the chimney-draught, and should be sheltered from down-draughts.

Very regrettably a fashion has crept in, in buildings warmed by central heating and lit by electric light, of providing no chimney ventilation in apartments. The heating and lighting do not vitiate the air, but the persons in the room do so; and opening windows is not satisfactory in cold weather.

For recent developments in connection with ventilation and gas-fires, see a pamphlet (*Gasfeuerstätten*) issued by the German Gas Association, Berlin, and a paper read before the same association, in June 1927, by Spaleck (*Das Gas- und Wasserfach*, No. 23, June 1927, pp. 554–562). See also RESPIRATION.

Ventimiglia, a small town of the Italian Riviera, on the east bank of the Roia near the French frontier, 3 miles E. of Mentone by rail. The Roman Albintimilium, the theatre and other buildings of which have been found, lay a little to the east. The old town has a Gothic cathedral and an octagonal baptistery, which with the seminary form a characteristic group. S. Michele is an interesting old church. The new town lies below, near the coast. Pop. 14,000. There is a considerable trade in cut flowers. To the west lies the promontory of Mortola (q.v.), with the famous garden belonging to the Hanbury family. Further west again, but still within Italian territory, near Grimaldi, are the Balzi Rossi, where important cave deposits of the Palæolithic period have been found.

Ventnor, the principal town on the south shore of the Isle of Wight, 11 miles by rail S. by W. of Ryde. Situated amid the finest of the fine scenery of the Undercliff, it has a southern exposure, is well sheltered from the north, and so possesses a mild climate, suitable for various classes of invalids. The beach is composed of beautiful yellow shingle; and fossils are found in great quantity in the vicinity. Pop. 6000. See WIGHT (ISLE OF).

Ventriculites, fossil sponges found in the Cretaceous System (q.v.), and often giving their shape to flint nodules.

Ventriloquism, the art of producing tones and words without any motion of the mouth, so that the hearer is induced to refer the sound to some other place. It does not depend on any peculiar structure of the organs of voice, but upon practice and dexterity. The name is founded upon the mistaken supposition that the voice proceeds from the belly. The art of the ventriloquist consists mainly in taking a deep inhalation of breath, and then allowing it to escape slowly; the sounds of the voice being modified and muffled by means of the muscles of the upper part of the throat and of the palate. The ventriloquist avails himself at the same time of means such as are employed by sleight-of-hand performers to mislead the attention. Ventriloquism is a very ancient art; the Greeks ascribed it to the operation of demons, and called ventriloquists *Engastrimanteis* ('belly-prophets').

Ventspils. See WINDAU.

Venue, the district from which a jury comes to try a question of fact; this, according to English law, should be the county where a crime is alleged to have been committed or a cause of action to have arisen, but modern rules permit civil cases to be set down wherever they may most conveniently be tried. In criminal cases, if a fair trial cannot be had in the county where the venue is laid, the High Court may change the place of trial. A similar power has often been conferred by statute on the Irish courts, when there has been reason to apprehend that a local jury would be liable to intimidation or undue influence.

Venus, originally a Roman goddess of spring, patron of flower-gardens, was subsequently identified with the Greek Aphrodite (q.v.), and so became also the Roman goddess of Love. In this capacity she is first heard of about 217 B.C. But over and above her cult as love-goddess she was worshipped by the Romans as *Dea Genetrix*, mother of the race, on account of her being the mother of Æneas (q.v.). She was also regarded as the tutelary goddess of the city of Rome, and as the ancestress of the Gens Julia. Hadrian built her a great temple in the Forum. Her sacred day was the 1st April. The ideal beauty of Venus was that created for the Greek Aphrodite; the famous statues of Venus are in fact Aphrodites. Most famous was that by Praxiteles at Cnidus, of which there are ancient copies at Munich and elsewhere. Of the great originals still extant by far the noblest is the Venus of Melos ('di Milone'), now in the Louvre, which was found on the island of Melos in 1820; the author and date are unknown. Next most famous are the Venus of Capua, at Naples; the Venus de Medici, now at Florence, but found at Rome near Tivoli in the 18th century, and long kept at the Villa Medici; and the crouching Venus of the Vatican. For the planet Venus, see PLANETS; and for the transits of Venus, see SUN. Venus' Flower-basket is one of the Sponges (q.v.); Venus' Fly-trap, one of the Insectivorous Plants (q.v., p. 162); and Venus' Girdle, one of the Ctenophora. See PERVIGILIUM VENERIS.

Venusberg. See TANNHÄUSER.

Venus' Looking-glass (*Specularia Speculum*), a very pretty little annual, of the family Campanulaceæ, which has long been a favourite in flower-gardens, and is a native of cornfields in the south of Europe. It has brilliant blue, white, or violet-coloured flowers, which fold up in a pentagonal manner towards evening. There are seven or eight other species, one a native of Britain (*S. hybrida*), all being pretty, neat herbs.

Vepses. See TSCHUDES.

Vera, AUGUSTO, philosopher, was born 4th May 1813 at Amelia in Umbria, studied at Rome and Paris, and, after teaching philosophy in France for thirteen years, lived in England from 1851 to 1860. From 1862 till his death (13th July 1885) he was professor at Naples University. He is known chiefly for his translations of Hegel's works into French, and for having introduced Hegel into Italy. But he wrote much on many subjects—on Plato's doctrine of immortality, on Strauss, on Cavour, on capital punishment, and, in English, an *Inquiry into Speculative and Experimental Science* (1856) and an *Introduction to Speculative Logic and Philosophy* (St Louis, 1875). See a monograph by Mariano (Naples, 1887).

Vera Cruz, the principal port of Mexico, lies on the east coast, in a low, unhealthy plain, backed by drifting sandhills, 293 miles by rail E. of the capital. The harbour was only an open roadstead between the city and the island castle of San Juan de Ulúa until breakwaters and docks were made at the end of the 19th century. The streets are wide and straight, with numerous squares, and low, picturesque houses of various colours. The chief buildings are the cathedral, custom-house, and casino; a number of the churches have been turned into tobacco-factories. The moist, hot climate of Vera Cruz was notoriously unhealthy, with a high death-rate, before sewerage and water-supply were modernised. The sanitation now is more or less satisfactory, while the fierce 'northers' help to sweep away the fevers. Most of the commerce is in the hands of foreigners. Pop. 48,000. —The full title of the city is *Villa Nueva de la Vera Cruz*, or 'New City of the True Cross.' The old town was founded by Cortes in 1520 on the spot where he had landed the year before; the new one dates from 1599. The royal forces held out in the castle till November 1825. The castle capitulated to the French in 1838, and to General Scott in 1847. During the French occupation the town was the base of supplies from 1862 to 1867, while in 1914 it was occupied by United States bluejackets.

Veratrine. See SABADILLA.

Veratrum. See HELLEBORE.

Verbascum. See MULLEIN.

Verbena, a genus of plants of the family Verbenaceæ. The genus consists of numerous species of herbs or shrubs which inhabit the tropical and subtropical parts of the world; most numerous in America, more rare in Asia and Africa. One species, the Common Vervein or Vervain, is a native of the southern counties of England, and is occasionally met with in Ireland and in Scotland. They have opposite leaves, sessile bracteated flowers in simple or panicled spikes, terminal or axillary; a tubular five-toothed calyx, tubular corolla more or less curved with a spreading limb, generally unequally lobed; four stamens, included in the tube, the upper pair sometimes without anthers; a slender style with capitate stigmas. The ripe fruit splits into two or four nutlets, each containing one seed. The genus is more remarkable for the beauty of a number of the species, which under cultivation have given origin to numerous varieties greatly prized for their brilliant coloured flowers, than for other virtues, although formerly the British species was credited with potent medicinal qualities, purely imaginary, it would seem. It was also worn on the person as a protection against blasts and to promote general good-fortune, for which purpose it was gathered with special observances and ceremony. The Lemon-scented Verbena, *Lippia* or *Aloysia citriodora*, belongs to the same family. Perfumers' Oil of Verbena is derived from it, and from the Lemon-grass (q.v.).

Verbena officinalis.

Verbenaceæ, a family of gamopetalous dicotyledons, consisting chiefly of trees and shrubs, but partly also of herbaceous plants. The leaves are generally opposite and simple, and have no stipules; the flowers are generally in corymbs or spikes. The species are chiefly tropical, some of them natives of temperate countries. The Verbenaceæ are allied to Labiatæ both in botanical characters and in properties, but the leaves have no oil-glands. Some are beautiful ornaments of gardens and hothouses; some are esteemed for

their fragrance; some are used in medicine; the fruit of some species, as *Premna esculenta* and species of Lantana, is eaten; the leaves of *Stachytarpheta indica* are used as a substitute for tea; and the timber of a number of species (e.g. teak) is valuable.

Verboeckhoven, EUGEN JOSEPH (1799–1881), a Flemish painter of animals, specially noted for landscapes with sheep.

Vercelli, the ancient *Vercellae*, a thriving town in North Italy, 40 miles SW. of Milan by rail, with several old churches, including the Romanesque-Gothic church of S. Andrea (1219–24) with the adjacent hospital, and the church of S. Cristoforo with fine examples of the work of Gaudenzio Ferrari; a 13th-century castle; a cathedral, begun in 1562 and completed in 1860; and manufactures of machinery, candles, matches, soap, and musical instruments. Pop. of commune (1921) 32,769. Among the important MSS. in its libraries are an ancient Latin version of the four gospels, and the 'Vercelli Book,' a mutilated but invaluable collection of the remains of Old English literature, made probably about the time of Edward the Confessor, but discovered by Dr Blume at Vercelli in 1823. It contains six homilies and six poems; and a transcript was published for the Record Commission in 1836. The more important poems, *St Andrew* and *The Finding of the Cross*, have been separately edited.

Vercingetorix. See ALESIA, and CÆSAR.

Verdaguer, JACINTO (1845–1902), Catalan poet, born at Folgarolas, near Vich in Catalonia, wrote *L'Atlantica*, *Lo Canigou*, and other poems.

Verde, CAPE. See CAPE VERD.

Verde-antico, a beautiful stone of a dark-green colour, with patches of white, and sometimes also black and red. It is a mixture of serpentine with limestone, dolomite, or magnesite, and was much prized by the ancient Romans, and is still in great favour in Italy. Oriental verde-antico is a green porphyry having much the same structure and texture as rosso antico (see PORPHYRY).

Verden, a town of 10,000 inhabitants in the Prussian province of Hanover, on the Aller near its junction with the Weser, and 20 miles SE. of Bremen by rail. It has a Gothic cathedral of 1290–1490, and is noted as the place where in 782 Charlemagne massacred his Saxon captives.

Verdi, GIUSEPPE, Italian opera composer, was born at Roncole near Busseto, 9th October 1813. At ten years he was organist of the small church in his native village, the salary being raised after a year from £1, 8s. 10d. to £1, 12s. per annum. At the age of sixteen he was provided with funds to prosecute his studies at the conservatorium at Milan; but at the entrance examination he showed so little evidence of musical talent that the authorities declined to enrol him. Nothing daunted, he pursued his studies with ardour under Lavigna from 1831 to 1833, when, according to agreement, he returned to Busseto to take the place of his old teacher Provesi, now deceased. After five unhappy years in a town where he was little appreciated, Verdi returned to Milan. His first opera, *Oberto, Conte di S. Bonifacio*, is chiefly indebted to Bellini, and the next, *Un Giorno di Regno* (which fulfilled its own title, as it was only once performed), has been styled 'un Bazar de Réminiscences.' Poor Verdi had just lost his wife and two children within a few days of each other, so it is hardly to be wondered at that a comic opera was not a very congenial work, nor successfully accomplished. *Nabucodonosor* (1842) was his first hit, and in the next year *I Lombardi* was even more successful—partly owing to the revolutionary feeling which in no small degree was to help him to his future high position. Indeed his name was a useful acrostic to the revolutionary party, who shouted 'Viva Verdi,' when they meant 'Viva *V*ittorio *E*manuele *R*e *D'I*talia.' *Ernani*, produced at Venice in 1844, also scored a success, owing to the republican sentiment in the libretto, which was adapted from Victor Hugo's *Hernani*. Many works followed in quick succession, each rousing the enthusiasm of the audiences chiefly when an opportunity was afforded them of expressing their feelings against the Austrian rule. Only with his sixteenth opera did Verdi win the supremacy when there were no longer any living competitors; and *Rigoletto* (1851), *Il Trovatore*, and *La Traviata* (1853) must be called the best as they are the last of the old Italian Opera school. *I Vespri Siciliani* (1855) and *Simon Boccanegra* (1857) were not so successful as *Un Ballo in Maschera* (1859); and none of them, any more than *La Forza del Destino* (1862) or *Don Carlos* (1867), added anything to the fame of the composer of *Il Trovatore*. Only now begins the interest which the student of musical history finds in Verdi's life. Hitherto he had proved a good man struggling with adversity and poverty, a successful composer ambitious to succeed to the vacant throne of Italian opera. But the keen insight into dramatic necessity which had gradually developed and had given such force to otherwise unimportant scenes in earlier operas also showed him the insufficiency of the means hitherto at the disposal of Italian composers, and from time to time he had tried to learn the lessons taught in the French Grand Opera school, but with poor success. Now a longer interval seemed to promise a more careful, a more ambitious work, and when *Aïda* was produced at Cairo (1871) it was at once acknowledged that a revolution had taken place in Verdi's mind and method, which might produce still greater results. The influence of Wagner and the music-drama is distinctly to be felt, and the advantage of more deliberate work. But Verdi was apparently not yet satisfied. For sixteen years the successful composer maintained absolute silence in opera, when whispers of a great music-drama roused the expectation of musical Europe to an extraordinary pitch; nor were the highest expectations disappointed when *Otello* was produced at Milan in 1887. The surrender of Italian opera was complete, and Verdi took his right place at the head of the vigorous new school which has arisen in Italy. A comic opera, *Falstaff* (based on *The Merry Wives of Windsor*), was produced in 1893 by the composer, who was ennobled; a Requiem Mass (1874) was his only important non-operatic work. *Otello* and *Falstaff*, with their powerful characterisation and brilliant orchestration, show an enormous advance on the banalities and vulgarities that are scattered too frequently among Verdi's earlier works. Wagner's use of the *leit-motif* is not imitated to any extent, but *bel canto* and free recitative are combined with the happiest results, though due acknowledgment must be made of the excellent Shakespearian libretti furnished by the poet and musician Boito (q.v.). He died on the 27th of January 1901 at his villa of S. Agato near Busseto.

See OPERA; also Lives in English by Crowest (1897) and A. C. Mackenzie (1913), in Italian by Checchi (1901) and Boni (1901), in French by Bellaigue (1911), in German by Weissmann (1922). The article in Grove's *Dictionary* is full, but almost over-enthusiastic.—*Verdi*, an interesting novel by Werfel (in German 1923; trans. 1926), deals with a supposed visit of Verdi to Venice during Wagner's residence there in the winter of 1882–83.

Verdict. See JURY, CRIMINAL LAW.

Verdigris is a basic acetate of copper, or rather it is a mixture of three such acetates. This sub-

stance has long been largely made at Montpellier in France, by exposing thin sheets or strips of copper to the vapour of acetic acid arising from fermenting grape skins. Verdigris is used by itself as a green pigment, and also in the manufacture of several other green colours. It was in use as a paint by the ancient Romans, and it has continued to be employed as such to the present time. But as it suffers from exposure to impure air, and acts injuriously on some other pigments if mixed with them, it has fallen very much out of use for artistic work. Mixed with white-lead, it is largely used in Russia for painting iron roofs, the mixed paint changing by exposure from a bluish to a fine green colour. External wood-work is coated with it in Holland, partly, perhaps, because it is a good preservative of timber. Verdigris is very poisonous, and as it has a tendency to form on copper cooking-vessels they should always be kept perfectly clean.

Verditer. This pigment is a hydrated oxide of copper formed by adding lime to a solution of a copper salt, such as the nitrate, when a blue precipitate is thrown down. This blue verditer is scarcely injured by light, but it is blackened by impure air. It is used in common distemper painting and in paper-staining. Green verditer is the blue pigment changed to green by boiling, but it is a colouring substance of little value.

Verdun, a town in the French department of Meuse, 40 miles W. of Metz, where the Meuse divides into five branches. By the loss of Metz, Verdun became the strongest town in the east of France; the defences consisted of eleven detached forts in a circle round the town, four on the left and seven on the right bank of the Meuse, the series on the right being connected by a chain of forts with the defensive works of Toul. The cathedral dates from the 14th century; there are manufactures of linen. The Gallo-Roman *Verdunum*, it became part of the kingdom of Austrasia. In 843 a famous treaty was made here between the Emperor Lothaire and his brother Ludwig the German and Charles the Bald, by which the Frankish empire was divided into three. In the 9th century it became part of Lorraine, and was German till the Reformation, having latterly been a Free Imperial city. The citizens waged many a long and bitter struggle with their bishops, who ruled the surrounding country. In 1552 Henry II. of France seized the town, which the empire relinquished only in 1648. The fortress has been often besieged, as it was by the Germans for six weeks in 1870, when it capitulated; and it was the last place held by Germany, restored only in September 1873. During the World War (q.v.), Verdun was the scene of much fighting, but was never captured by the Germans. The offensive of Falkenhayn, which began the Battle of Verdun (February to July 1916), ended in a French victory for Pétain and Nivelle, but the losses on both sides were enormous. The hills covering the town on the N. and NE. were the most fiercely contested, while the town itself was largely destroyed by artillery fire. Pop. (1921) 28,882.

Verdun, a south-western suburb of Montreal.

Vere. See CAMPVERE.

Vere, AUBREY THOMAS DE (1814–1902), poet, was born in County Limerick, the third son of Sir Aubrey de Vere, himself a poet, author of *Julian the Apostate*, *Mary Tudor*, and other dramatic and poetic works. De Vere was educated at Trinity College, Dublin, and in 1851 joined the Church of Rome. Early attracted by the poetry of Wordsworth, he subsequently made the acquaintance of the poet, and, turning to writing himself, published in 1842 his first work, *The Waldenses*, a lyrical drama, which was followed in 1843 by *The Search after Proserpine*, and other poems. *Poems Miscellaneous and Sacred* (1853) bear obvious marks of his religious experiences. This volume was followed in 1857 by *May Carols*. From 1861 De Vere entered on that series of poems inspired by Irish subjects by which he is best remembered. These poems, presenting a curious combination of bardic and ecclesiastical mediævalism, include *Inisfail, a Lyrical Chronicle of Ireland* (1861), *The Infant Bridal* (1864), *Irish Odes* (1869), and *The Legends of St Patrick* (1872). *Alexander the Great* (1874) and *St Thomas of Canterbury* (1876) are semi-philosophical dramas. His prose volumes on public questions include *English Misrule and Irish Misdeeds* (1848) and *Ireland's Church Property and the Right Use of It* (1867). His more strictly literary prose writings were collected in *Essays, chiefly on Poetry* (1887), and *Essays, chiefly Literary and Ethical* (1889). De Vere's voluminous works were collected in six volumes in 1884, but he subsequently published *Legends and Records of the Church and Empire* (1887), *Mediæval Records and Sonnets* (1893), and *Recollections* (1897), containing many interesting memories of Wordsworth, Hartley Coleridge, Newman, Manning, and others of the poet's most eminent contemporaries. See a volume of *Selections* (1890), and the Memoir by Wilfrid Ward (1904).

Vere, EDWARD DE, EARL OF OXFORD (1550–1604), one of the best of the courtier poets of Elizabeth's early reign, studied at Cambridge, succeeded his father as seventeenth earl in 1562, and, becoming a favoured courtier, was appointed to high offices, being special commissioner for the trial of Mary, Queen of Scots, and Lord Chamberlain at James I.'s coronation. But though handsome and accomplished, he was luxurious and ruinously extravagant, and his estates had to be sold. Burghley, his father-in-law, provided for his family. Some twenty-three poems by Oxford were printed in the *Paradise of Dainty Devices* and other anthologies, and Grosart included his poems in his *Miscellanies of the Fuller Worthy Library* (1872).

Vere, SIR FRANCIS, soldier, was born probably in 1560 at Crepping or Crustwick, son of the fourth son of the 15th earl of Oxford. The family of Vere was one of the most ancient and famous in England; its head was hereditary Grand Chamberlain. The earldom of Oxford was created in 1137, and continued unbroken through twenty earls down to 1703. The home of the family was the valleys watered by the Colne and Stour—the borderland of Essex and Suffolk; the chief seat was Hedingham, the great keep of which is the finest relic of Norman civil architecture in England; their burial-place was the priory of Earl's Colne, 7 miles down the river.

Francis Vere obtained a company in the Bergen-op-Zoom garrison in the autumn of 1586, and won his first laurels in the memorable siege of Sluys, being knighted by Lord Willoughby at its close. Him he succeeded in August 1589 in the chief command in the Netherlands, with the rank of sergeant-major general. His spirit and courage even when desperately wounded made him a soldier's hero, while his skill and energy as a captain at Breda, Deventer, and a hundred fights carried his fame far beyond the Netherlands. He shared the glory of the Cadiz expedition (1596) as lieutenant-general and lord-marshal, and also next year the failure of the Island Voyage, the only laurels in which fell to his bitter rival Raleigh. Again in Holland, he governed Brill, and helped Maurice to victory at Turnhout (1597) and Nieuwpoort (1600), as well as in the heroic defence of Ostend. He died in London, 28th August 1609, and was buried in Westminster.

His brother, HORACE, LORD VERE, was born in 1565, and at twenty went with Francis to the Netherlands, and took a hero's share in all his battles. Knighted for his courage at Cadiz, he succeeded his brother as governor of Brill, and at the beginning of the Thirty Years' War was sent by James I. to defend the Palatinate. But he was shut in at Mannheim and forced to surrender to Tilly (1623). He was created Baron Vere of Tilbury in 1625, and died suddenly at Whitehall, 2d May 1635. Fuller describes him as having 'more meekness and as much valour as his brother. . . . Sir Francis was more feared, Sir Horace more loved, by the soldiers.'—Another brother, ROBERT, died in the Netherlands on the battlefield, after but six years of service (1595). See Clements R. Markham, *The Fighting Veres* (1888).

Vereeniging, a town of Transvaal, 49 miles SSW. from Johannesburg, is a centre of coal-mining. The treaty of peace between the Boers and British was signed here on May 1902.

Verestchagin, VASILI, painter, was born, 26th October 1842, at Tcherepovets in the government of Novgorod, and studied at the Naval School in St Petersburg, becoming an officer in 1859. He subsequently gave himself to art, and, after a sojourn in Tiflis, became a pupil of Gérôme at Paris. In 1867 he was with Kauffmann in the Turcoman campaigns, the fruits of which he put on canvas in Munich; and he reaped a richer artistic harvest from a visit to India in 1874. Still more famous were his painfully realistic pictures of the horrors of the fightings, plunderings, amputations, and battlefields cumbered with mutilated corpses of the Russo-Turkish war of 1877, as also of the execution of mutinous sepoys by English soldiers. In 1884 he made another journey to India by way of Palestine. He went to Port Arthur during the Japanese war, and perished when Admiral Makaroff's flagship was sunk by a Japanese mine on the 13th April 1904. He published autobiographical sketches of his travels (trans. 1887), and a book on *1812: Napoleon in Russia* (1899), and there was a Life of him by his brother (trans. 1888). *At Home and in War* (trans. 1888) is by his brother Alexander Vasilievitch Verestchagin.

Verga, GIOVANNI (1840–1922), novelist, was born at Catania in Sicily, and after some excursions into bourgeois conventionalism, became the founder of modern Italian realism in literature. In the collections of short stories *La Vita dei Campi* (1880), *Novelle Rusticane* (1883, from which comes the story of Mascagni's opera, *Cavalleria Rusticana*), and in the novels *I Malavoglia* (1881), *Mastro-Don Gesualdo* (1888), Verga portrays, with intense simplicity and vitality, the rough humours and passions of Sicilian peasant life. D. H. Lawrence has translated some of his work. See study by Russo (1920).

Vergennes, CHARLES GRAVIER (1717–87), French statesman, who, after a diplomatic career in Germany, Turkey, and Sweden, became Louis XVI.'s minister of foreign affairs, and, adopting the deliberate policy of humbling England by promoting the independence of the United States, concluded the alliance of 1778. See his *Vie Publique et Privée* by Mayer (Paris, 1789), and Diniol, *La Participation de la France à l'Établissement des États Unis* (1889).

Vergil. See VIRGIL.

Vergil, POLYDORE, otherwise named De Castello, was a native of Urbino in Italy, born about 1470. He had his education at Bologna, and seems to have commenced life under the patronage of Guido Ubaldo, Duke of Urbino, to whom was dedicated his first work, *Proverbiorum Libellus* (Ven. 1498), an earlier book than the *Adagia* of his friend Erasmus. His second, *De Inventoribus Rerum* (Ven. 1499), was also the earliest book of its kind, became extremely popular, and was translated into English, Spanish, and Italian. Already chamberlain to Pope Alexander VI., Polydore Vergil was sent to England in 1501 as deputy-collector of the tribute called Peter's-pence, his superior in the office being his kinsman, Adrian de Castello, now Cardinal Sti. Chrysogoni, and soon after Bishop of Hereford. Polydore was presented to the living of Church Langton in Leicestershire in 1503, and next year was enthroned as the Bishop of Hereford's proxy on his translation to the see of Bath and Wells. In 1507 he was collated to the prebend of Scamblesby in Lincoln, in 1508 was nominated archdeacon of Wells, was naturalised in 1510, and collated to the prebend of Oxgate in St Paul's in 1513. Early in 1515 he was flung into prison for sending abroad slanderous letters about Wolsey, but apparently was soon released, whether from the entreaties of Leo X. and the Cardinal de Medicis or his own abject appeals to Wolsey. In 1525 he published the first genuine edition of Gildas, the year after the treatise *De Prodigiis*, dialogues in attack upon divination. His *Historiæ Anglicæ Libri XXVI.* appeared at Basel in 1534; the 27th book, bringing the story down to 1538, was added in the third edition (1555). About 1550 he obtained a license from Edward VI. to return to Italy for his health's sake, without losing his livings, and next he travelled to Urbino, where he lived in quiet till his death in 1555.

Polydore Vergil's History is a work of great research, vigorous and independent, written in clear and elegant Latin. It is the fullest original narrative for the reign of Henry VII., and here Hall has simply translated his Latin into English. As regards Wolsey, the value of his evidence is discounted by his strong prejudice. He spared no pains to ensure accuracy, and a strongly rational bias of mind hindered him from accepting the Scottish fables supplied him by Gavin Douglas, or the exploits of Brut and Arthur warranted by Geoffrey of Monmouth.

The work down to Richard III. was translated in the 16th century; and books xxiii.–xxv., relating to the reigns of Henry VI., Edward IV., and Richard III., were republished in 1844 by the Camden Society, with a preface by Sir H. Ellis. Another Camden Society issue, by the same editor, was the translation of the first eight books, coming down to the Norman Conquest (1846). See Johnson, *Rise of English Culture* (1904).

Vergniaud, PIERRE VICTURNIEN, one of the greatest orators of the French Revolution, was born at Limoges, 31st May 1753, the son of an unprosperous merchant there. Turgot, then intendant of the Limousin, divined his promise, and nominated him to a bursarship at the Collège du Plessis at Paris. He studied divinity aimlessly at the Sorbonne, but soon grew tired of it, next took a post in the civil service at Paris, but ere long threw it up and retired to his bankrupt father's house at Limoges. But a brother-in-law helped him to settle as an advocate at Bordeaux in 1781, and he quickly gained a great practice, and was elected a deputy to the National Assembly in 1791. His splendid eloquence, the charm of his personality, made him the leader of the Girondists, but he was too indolent and unambitious to care for political intrigue, and indeed he was far more of the orator than the statesman. Sent to the Convention by the department of the Gironde, he supported, in the question of the king's trial, the proposal of Salle to make an appeal to the people. When the decisive moment came he voted for death, and

as president it was his duty to announce the result. In the struggle with the Mountain he made a splendid effort, but too late. He was guillotined 31st October 1793, the last of the twenty-one who died together.

See Vatel, *Vergniaud: Manuscrits, lettres et papiers* (2 vols. 1875); Aulard, *Les Orateurs de la Législative et de la Convention* (vol. i.); and the Lives by Touchard-Lafosse (1848) and Verdière (1866). See also vol. i. of H. Morse Stephens, *The Principal Speeches of the Statesmen and Orators of the French Revolution* (1892).

Verhaeren, Émile (1855–1916), Belgian poet, was born at St Amand near Antwerp, and studied law for a time. He was killed by an accident in Rouen railway station. His chief work comprises *Les Soirs* (1887), *Les Débâcles* (1889) and *Les Flambeaux noirs* (1889), a sombre but powerful trilogy, introspective; *Les Campagnes hallucinées* (1893) and *Les Villes tentaculaires* (1909), in which he regrets the feverish rush to the towns from the country; *Les Heures claires* (1896), *Les Heures de l'après-midi* (1905), and *Les Heures du soir* (1911), a trilogy of delicate love-poems; *Toute la Flandre* (1904–11), a series of five volumes, in which he depicts his native Flanders with its mediæval glories and humble peasant life; while other works are *Les Forces tumultueuses* (1902), *La multiple Splendeur* (1907), *Les Rhythmes souverains* (1910), *Les Ailes rouges de la guerre* (1916), and the drama *La Cloître* (1900). Verhaeren, a 'realistic visionary,' could appreciate the poetry of the modern city (especially London) with its machinery and crowded streets, and though his sympathies remained Flemish yet he voiced vividly, sometimes brutally, contemporary fears and aspirations. See Study by Zweig (in German 1910; Eng. trans. 1914) and selections by Strettell (in Eng. 1915) and Heumann (in Fr. 1916).

Verjuice (Old Fr. *verjus*, 'juice of green fruit'), a vinegar formerly much used, made from sour cider, or from the juice of the wild crab-apple. The expressed juice of unripe grapes is another kind of verjuice used in the vine districts. Both are occasionally employed in cooking.

Verkhne Udinsk, capital of the Mongol-Buriat republic in Siberia, on the Selenga and the Trans-Siberian Railway, E. of Lake Baikal; pop. 30,000.

Verkhoyansk, a small town of Siberia, on the Yana River, 400 miles NE. of Yakutsk, one of the coldest places on the earth. See Temperature.

Verlaine, Paul, French poet, was born at Metz, 30th March 1844, and chose French nationality in 1873. He began his course with *Poèmes saturniens* (1866), *Les Fêtes galantes* (1869), and *La bonne Chanson* (1870). Then followed a dozen years of silence, of Bohemianism, of the hospitals, and of Villon-like adventures (including the friendship and quarrel with the poet Rimbaud), round which legends enough have clustered. His next work, *Sagesse* (1881), breathed penitence and devotion in verse of singular sweetness, which Jules Lemaître makes bold to compare with the *Imitation* itself. *Les Poètes Maudits* (1884), a volume of literary criticism, was followed by *Jadis et Naguère* (1885), *Romances sans Paroles* (1887), *Amour* (1888), *Bonheur* (1889), and *Parallèlement* (1890), the last a strange collection, the poet singing alternately perverse sin and religious repentance. *Dédicaces* dates from 1894; and *Confessions: Notes Autobiographiques*, from 1895. Verlaine died 8th January 1896. The poetry of Verlaine, by reason of its limpid and musical cadences (which have made such an appeal to Debussy and other composers), its lyric spontaneity, and its exquisite and unconventional fantasies, is assured of a place in the front rank of French literature. See the standard Life by Lepelletier (1907); also *Verlaine intime* (1898) by Donos, and studies by Zweig (1913) and Nicolson (1921).

Vermeer, Jan (1632–75), of Delft, often but wrongly called Van der Meer, was an eminent Dutch painter who for two centuries was all but forgotten, his pictures being sold (with forged signatures) as by Metzu, Terborch, and Rembrandt. He was a great colourist, and attained charming effects of light and shade. See books by E. V. Lucas (1922) and Hausenstein.—An earlier Jan Vermeer or Van der Meer (1628–91), called 'of Haarlem,' was also a notable painter of landscapes of the Haarlem region, much in the manner of Ruysdael; and his son Jan 'the Younger' (1656–1705) painted and etched.

Vermicelli. See Macaroni.

Vermifuges, also called Vermicides or Anthelmintics, are remedies for destroying intestinal worms, or for expelling them from the digestive canal; thus for Tapeworms, extract of male-fern root is used, and turpentine; for Round-worms, santonin; for Thread-worms, santonin and saline cathartics, as well as injections of common salt, strong green tea, quassia, or steel drops.

Vermilion (sulphide of mercury, Hg, 87; S, 13) exists in the native state as Cinnabar (q.v.), from which this beautiful red pigment is obtained by selecting pure pieces and simply grinding them. It is, however, generally made artificially. By one dry process the first step is to prepare an intimate mixture of 100 parts of mercury and 18 parts of sulphur, which are agitated together in revolving vessels until they have combined. The powder so obtained is afterwards sublimed in specially constructed retorts, and the purest portion condensed on the heads of the retorts is then treated with a little caustic potash, and washed with warm water. One of several wet processes in use for making vermilion consists in combining mercury and sulphur by grinding them together in the presence of water, caustic potash being afterwards added, and the mixture triturated for some hours at a temperature of 113° F. The product is afterwards thoroughly washed. The Chinese have long made beautiful vermilion. See Pigments, and Red.

Vermin (Fr. *vermine*, through *vermineus* from Lat. *vermis*, 'a worm'), a worm or grub; more usually obnoxious insects, as bugs, fleas, and lice; troublesome animals, such as mice, rats; animals destructive to game, such as weasels, polecats, also hawks and owls. Badgers and otters come under this name; and the fox is called vermin, but without disrespect. See the articles on the various animals named; also Insect-powder.

Vermont', the only entirely inland state of New England, and the least occupied in manufacturing industries, received its name from its mountains. It lies west of New Hampshire, with Canada on the north, Massachusetts on the south, and New York and Lake Champlain on the west. Its length from north to south is 143 miles, its width from 40 to 85 miles, area 9564 sq. m. The Green Mountains extend its entire length, being divided in the northern part, and forming a second range. Four peaks rise beyond 4000 feet above sea-level. The surface of the state is broken by many hills. The mountains are mostly clothed with trees to their summits. The hills furnish the best of pasturage, and, for the most part, can be cultivated to their tops. The air is pure and invigorating, and the scenery varied and beautiful. The average temperature is from 40° to 47° F., and the rainfall from 30 to 40 inches.

Vermont is exceptionally rich in quarries of granite, marble, and slate, which are extensively worked; and there are other minerals. Many of

the rocks contain lime, and by disintegration make a strong soil. Agriculture is important, and Indian corn, potatoes, oats, and hay are grown in large quantities. The annual product of maple sugar exceeds that of any other state, and is nearly one-half of the total product of the country. By reason of the richness of the pasturage, the butter and cheese produced are of a superior quality while breeding of excellent horses and (merino) sheep is carried on. The manufactures are chiefly in connection with the preparation and development of the mineral and agricultural wealth of the state, but there is a very large timber trade.

The state returns two representatives to congress. The state prison is at Windsor; and there are insane asylums at Brattleboro and Waterbury, a reform school at Vergennes, and a house of correction at Rutland. Vermont possesses, besides its public schools and academies, Vermont University (1800), Middlebury College, and Norwich University.

History.—Samuel Champlain, in 1609, was the first white man who looked upon Vermont. In 1724 Massachusetts built Fort Dummer (near Brattleboro). A permanent settlement was made at Bennington in 1761; a year later, one in Newbury. The whole territory now called Vermont was claimed by New Hampshire, and Governor Wentworth, of that state, between 1762 and 1768, conveyed to settlers 138 townships. These went by the name of 'New Hampshire Grants.' New York, however, asserted that the whole territory belonged to her, under a charter given by King Charles II. to the Duke of York; and in 1763 Governor Tryon ordered a sheriff to eject all settlers holding lands under titles from New Hampshire. But the settlers, under the lead of Ethan Allen, Seth Baker, and others, organised themselves into companies, and agreed to protect each other against all efforts to drive them from their lands. These were called 'Green Mountain Boys.' Their opposition to the New York officers was so determined and effective that the latter were compelled to return home without accomplishing their purpose. New York appealed to King George, and obtained a decision supporting its title. But as the settlers had paid for their lands, they refused to give them up on the king's decree. A bloody contest seemed inevitable, but the opening of the revolutionary war engrossed the attention of all parties. The settlers, however, intent on maintaining their rights, met in convention, adopted a constitution, proclaimed their independence, chose representatives to congress, and asked admission into the Confederacy. New York, by persistent opposition, succeeded for thirteen years in keeping them out. Finally, on payment of $30,000, it yielded, and Vermont was received into the Union, March 4, 1791, as the fourteenth state. Meanwhile the settlers rendered valiant service to the other states during the revolutionary war at Ticonderoga, Crown Point, and Bennington. At the same time, all the diplomacy of Ethan and Ira Allen was brought into requisition to prevent the 'Grants' from being overrun by British troops from Canada, who hoped to retain Vermont a British colony.

In the civil war the state furnished 35,242 soldiers, or one for every ten of its entire population, and one-half of all its able-bodied men. Pop. (1800) 154,465; (1840) 211,948; (1880) 332,286; (1900) 343,641; (1920) 352,428. The principal towns are Burlington (22,779) and Rutland (14,954), while the state capital is Montpelier (7125) centrally located. See Histories of Vermont by Collins (1916) and Crockett (1921).

Vermouth (a French spelling of Ger. *Wermuth*, wormwood) is a white wine, super-alcoholised and aromatised with wormwood, gentian, and other herbs. It is much used as a cordial or appetiser in Italy, diluted with aerated water and sharpened with quinine. It is in no way analogous to Absinthe (q.v.), also derived from wormwood.

Verna, La, a mountain of Central Italy, 8 miles E. of Bibbiena, with a large monastery, belonging to the municipality of Florence, erected on the spot where St Francis of Assisi received the stigmata in 1224. The original chapel was erected by the saint himself in 1216; a larger church was built in 1348–1459. Both contain fine terra-cottas by Andrea della Robbia and his school. The isolated limestone peak, with a forest on the summit, commands a magnificent view.

Vernal Grass, Sweet (*Anthoxanthum odoratum*), common in Britain and throughout Europe and the northern parts of the world, is about a foot high, with spiked oblong panicle. It is relished by cattle, and is sown along with other grasses to form permanent pastures. The pleasant smell of newly-mown hay is often chiefly owing to this grass, which is fragrant when drying, and contains Coumarin (q.v.). It yields by distillation an essential oil of an agreeable odour. The straw is of use for the finest kinds of straw-plaiting.

Vernation, in Botany, a term employed to designate the manner in which the leaves are arranged in the leaf-bud. It corresponds with Æstivation (q.v.) in the flower-bud. There are great differences in the vernation of plants, which are characteristic not only of species but of genera, and even of natural orders; the vernation of the same species is always the same. In some plants the leaves are very simply placed together; in others they are most curiously folded, rolled, or plaited, and interlaced with each other, yet so as to separate most readily when the proper time for their expansion comes.

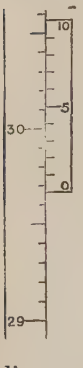
Verne, Jules (1828–1905), was born at Nantes, and trained to the law. After writing comedies and operatic librettos, and turning out a great deal of hackwork, he struck a new vein in fiction whereby he earned a world-wide reputation. He cleverly exaggerated the possibilities of present-day science, and gave ingenious verisimilitude to narratives of wild adventure carried out by means of marvellous inventions. His stories, which have been translated into well-nigh every European tongue, include *Five Weeks in a Balloon*, *Twenty Thousand Leagues under the Sea*, *From the Earth to the Moon*, *Around the Moon*, *Meridiana*, *The Survivors of the Chancellor*, *Martin Paz*, *Michael Strogoff*, *Keraban the Inflexible*, *The Green Ray*, *The Fur Country*, *A Journey to the Centre of the Earth*, *Hector Servadac* (a wonderfully clever account of a voyage on a comet), *The Mysterious Island*, and *Around the World in Eighty Days*. The two last named are his best books—*Around the World* being a little masterpiece of construction and exciting narrative. The characters in these singular tales are the veriest automata. There is not a drop of human blood in all Verne's clockwork crowd of explorers, sailors, engineers, reporters, scientists, and puppets with labels innumerable. The reader's interest depends as solely on incident as it does in the *Arabian Nights*, and in Verne's earliest stories the interest is wonderfully well sustained. See Life by Lemire (1908).

Verner's Law, in philology, explains certain apparent exceptions to Grimm's Law. The voiceless open consonants arising in Germanic from Indo-European voiceless stops underwent further changes if the vowel of the preceding syllable were unaccented. The same applies to *s*. This (with subsequent developments) explains the different consonants of English lose and lorn, see*th*e and

so*dd*en, and of German Mu*tt*er and Bru*d*er compared with Latin ma*t*er, fra*t*er. The law was formulated in 1875 by Karl Verner (1846–96).

Vernet, the name of three eminent French painters. Claude Joseph Vernet was born at Avignon in 1714, travelled in Italy, and worked for twenty years in Rome, but returned to Paris in 1753 to paint for the king the sixteen chief seaports of France. He died 3d December 1789. See the study by Lagrange (Paris, 1863).—His son, Antoine Charles Horace Vernet, popularly known as Carle Vernet, was born at Bordeaux in 1758. He received his education at the Academy of Paris, and, gaining the *grand prix* (1782), studied thereafter in Rome. He enjoyed a high reputation at Paris as a painter of horses, dogs, and large battle-pieces to the glorification of the great Emperor down to his death, 17th November 1836.—Émile Jean Horace Vernet, his son, was born in Paris, June 30, 1789, and had but an irregular education amid the tumults of the Revolution. He soon made himself exceedingly popular by abundant work always brilliant and vigorous, but hardly ever anything more. His best work is marked by the characteristic faults of improvisation; his detail has ever much more of phantasy than nature. But his battle-pieces—Friedland, Wagram, Jena, Fontenoy, Isly—were delightful incense to that mean shadow of a real patriotism, French Chauvinism. He was director of the French school of art at Rome from 1827 till 1835, he travelled in Algiers and Russia, and down till his death at Paris, January 17, 1863, honours were heaped upon him. See Durande, *Joseph, Carle, et Horace Vernet* (Paris, 1865).

Vernier, an auxiliary scale which facilitates the accurate reading of linear or angular scales. It was invented by Pierre Vernier (1580–1637), who spent most of his life in the service of the king of Spain in the Low Countries. Suppose we have a scale of inches graduated to tenths, and that we wish to measure accurately to hundredths. We must make a small scale, the vernier, with *ten* of its subdivisions equal either to *nine* or to *eleven* of the small divisions of the principal scale. It is evident that each division of the vernier is smaller (or greater) than each division of the scale by $\frac{1}{10}$ of that division—i.e. by $\frac{1}{100}$ of an inch. To use the instrument the vernier must be slid along parallel to the scale until its zero line comes opposite the position to be measured. The figure shows the position of the vernier (vernier subdivisions = $\frac{9}{10}$ main scale subdivisions) for the reading 29·67.



Here the zero of the vernier lies between the graduations 29·6 and 29·7. Running our eye up the scale we see that the seventh graduation on the vernier is exactly opposite a graduation on the scale. Hence the sixth on the vernier must be higher than the next lower graduation on the scale by $\frac{1}{100}$, the fifth by $\frac{2}{100}$, and so on to the zero of the vernier, which will be found accordingly to lie $\frac{6}{100}$ higher than 29·6. If the vernier subdivisions = $\frac{11}{10}$ main scale subdivisions the working is similar, but we have to run the eye *down* the scale. Verniers are not always constructed so simply as those just described; and on beginning to work with a graduated instrument the operator must by inspection discover the law of the vernier. For example, in the best forms of barometer the principal scale is graduated to half-tenths, and the vernier is so constructed as to have twenty-five divisions corresponding in total length to twenty-four on the scale. Each vernier division is less than each scale division by $\frac{1}{25}$ of $\frac{1}{20}$ of an inch—i.e. $\frac{1}{500}$ of an inch. The vernier graduations are named in order—0, 2, 4, 6, and so on to 50. Thus, if the vernier zero stands between 29·65 and 29·7, and if the vernier graduation 24 is exactly opposite a scale graduation, the reading is 29·65 + ·024, or 29·674. It may be that 24 lies a very little above a scale graduation, and the next vernier graduation, 26, a little below the next in order. The reading would then be 29·675. It is thus possible to read to thousandths of an inch, although the vernier is graduated so as to give only $\frac{1}{500}$ of an inch. The vernier has long superseded all other methods of accurate subdivision, and is an indispensable equipment of barometers, theodolites, sextants, and all astronomical and surveying instruments See Graduation, and Scales (Mathematical).

Vernon, a small town of the French department of Eure, on the Seine, 15 miles NW. of Mantes by rail. Pop. 8800.

Vernon, Edward, admiral, was born at Westminster in 1684, the son of a Whig statesman, who was secretary of state from 1697 to 1700. He entered the navy in 1701 and parliament in 1722; commanded at the storming of Portobelo (1739) and in the disastrous Cartagena expedition (1741); and died at Nacton, his Suffolk seat, 29th October 1757. See the *Memorial* by W. F. Vernon (1861).

Veroli, a small town and episcopal see of Central Italy, 5 miles by road SE. of Alatri. It was the ancient *Verulae*, and has remains of defensive walls of polygonal blocks of limestone. It also has some interesting mediæval churches, and the cathedral possesses valuable reliquaries, processional crosses, and other works of art. The Cistercian (now Trappist) abbey of Casamari, 9 miles to the east, is a very fine example of French Gothic, and closely resembles Fossanova (1187–1208), 12 miles NNW. of Terracina. Pop. of commune (1921) 15,096.

Verona, an ancient city of Italy, capital of a province in the division of Venetia, stands on a plain at the base of the foot-hills of the Alps, 72 miles W. of Venice by railway. It stands on a bend of the Adige, by which it is divided into two unequal parts, connected by six bridges. The aspect of the town and of the landscape around is remarkably fine. Verona is a fortress of the first class, and has always been considered a place of strength since in 265 A.D. it was surrounded with walls by the Emperor Gallienus, who used as city gates some earlier monumental arches (Porta dei Borsari, Porta dei Leoni, and Arch of the Gavii). After passing into the hands of the Austrians in 1815 it was greatly strengthened, being the most important point of the famous 'Quadrilateral' (q.v.) between the Po and the Alps, by which they maintained their hold on northern Italy. After 1849 they made every effort to render it impregnable. The walls are now obsolete, the strength of the city depending on a circle of outlying forts. Of its many interesting edifices the chief is the amphitheatre, built at the end of the 1st century A.D. The building has been fairly well preserved, the interior having, however, been 'restored.' It is frequently used for theatrical performances. The lesser diameter of the building is 404 feet, that of the arena 146 feet; and the edifice is calculated to have contained 22,000 people. Part of the theatre, on the left bank of the Adige, has been cleared. There is an important museum of inscriptions, commenced by Scipione Maffei in 1714, and the municipal museum is interesting, containing some mosaics found in 1885. The streets of Verona are wide, especially the Corso. There are four principal squares, of which the Piazza delle Erbe, or vegetable market, on the site of the ancient forum, is the most

picturesque; on one side is the massive, 12th century Palazzo del Comune, with a lofty tower. The adjacent Piazza dei Signori contains the palace of the Scaligers (1370), now the prefecture, and the superb Palazzo del Consiglio (usually called La Loggia, restored in 1873); in the centre is a monument to Dante. The cathedral dates from 1187, and has an altar-piece by Titian; the Romanesque basilica of S. Zeno, belonging to the same century, is larger and more interesting, and has a very high campanile; Sta. Anastasia is a splendid Gothic church in brickwork, also with a lofty campanile; S. Fermo Maggiore has a fine polychrome exterior; and there are many other churches, some of them containing fine paintings. The palaces are also numerous and fine, a number of them by Sammicheli (1484–1559), who was also famous as a military architect. The ancient castle of Theodoric is still a barrack; the castle of the Scaligers (1355) is also a barrack and arsenal. The picture-gallery is especially rich in pictures of the Veronese, Paduan, and Venetian schools. The most important masters of the Veronese school were Altichiero (14th century), Vittore Pisano (q.v.) or Pisanello, Francesco Morone (1474–1529), and Girolamo dai Libri (1474–1555). Paul Veronese, though a native, belonged to the Venetian school. Another native of Verona, Fra Giocondo (1435–1515), one of the finest minds of the Renaissance, was also eminent as an architect; but he has left little at Verona—for the Palazzo del Consiglio is not his work. Among the glories of the place are the tombs of the Scaliger family, with their wondrous wrought-iron railing of separate links, dating from 1350 to 1380, and forming with the Romanesque church of Sta. Maria Antica a remarkable group. There is much trade in corn, oil, and wine, and manufactures of silk, woollens and cottons, furniture, &c. Pop. of commune (1921) 92,536. The oldest inhabitants of Verona were Rhætians, who were conquered by the Celtic Cenomani. It afterwards fell into the hands of the Romans (the poet Catullus was a native), and under the empire became one of the most flourishing cities in the north of Italy owing to its strategic importance. Constantine took it by assault in 312; Stilicho defeated the Goths here in 402; Attila plundered it in 452; Theodoric the Ostrogoth defeated Odoacer here in 489, made it his residence, and figures much in mediæval legend as Theodoric of Verona (in German Dietrich von Bern). It was long the capital of the Lombards; afterwards it was torn by the struggles of Ghibellines and Guelphs, being the home of Shakespeare's Capulets and Montagues (q.v.). After the death of Ezzelino da Romano, a chief of the Montecchi (1227–59), the city chose in 1260 Mastino della Scala as podestà, and from that date his family exercised a powerful and brilliant tyranny over the city for 127 years, the most powerful of the Scala princes (in Latin *Scaligeri*; as having in legend been first to mount a ladder—Lat. *scala*—in a siege) being Can Grande I. (died 1329), the patron and protector of Dante. Mastino II. died in 1351, Can Grande II. in 1359, Can Signorio in 1375. In 1387 the city fell under the power of Milan, in 1405 under that of Venice, and with Venice passed under Austrian domination till 1866. See Alethea Wiel's *Story of Verona* (1902).

Veronal, or BARBITONE, a popular and reasonably safe hypnotic, added to the British Pharmacopœia in 1914, is chemically diethylmalonyl urea or diethylbarbituric acid. Very large doses are dangerous, and after prolonged use it loses its effect. It is used by drug-takers.

Veronese, PAOLO, the name by which Paolo Caliari (or Cagliari), a great artist of the Venetian school, is usually known. He was born at Verona, probably in 1528. A sculptor's son, he studied painting under an uncle, Antonio Badile, a respectable artist, and after some work in his native city and Mantua, in 1555 settled in Venice, where he rapidly acquired both wealth and reputation. The church of San Sebastiano, in Venice, contains many of his pictures (both frescoes and easel pictures, from the story of Esther, martyrdoms, &c.) which are reckoned the most important of his earlier period—the period before his visit to Rome (1563), when he first became acquainted with the masterpieces of Raphael and Michelangelo. The influence of the Roman school on his style was marked, new dignity, grace of pose, and ease of movement being added to his rich Venetian colouring; a specific decorative element is also hereafter more conspicuous. He was kept busy with innumerable commissions, some of which he executed elsewhere than at Venice (as at Vicenza and Treviso). He died in Venice, 19th April 1588, and was buried in San Sebastiano. Veronese is remarkable more for the fertility than for the depth or spirituality of his imagination. His design is generally noble, his composition rich, and his execution truthful. In the invention of details, especially, he is inexhaustible, and often overloads his pictures with ornament. One peculiarity of his works is the frequent introduction of splendid architectural backgrounds, which, however, were frequently painted by his brother Benedetto. The most celebrated of his works—many of them very large—is the 'Marriage Feast at Cana of Galilee,' now in the Louvre at Paris; it is 20 feet high, and 30 in length, and contains 120 figures, many of them portraits of contemporaries, and the details much more 16th-century Italian than ancient Jewish. Besides these may be mentioned 'The Calling of St Andrew to the Apostleship,' 'The Feast of Simon,' and (in the National Gallery) the 'Presentation of the Family of Darius to Alexander,' and 'St Helena's Vision of the Invention of the Cross.' Veronese was the last of the great Venetian painters.

See Symonds, *The Renaissance in Italy* (1877); Crowe and Cavalcaselle; and books by Yriarte (1888); Meisner (1897), and Mrs Bell (1904).

Veronica. See SPEEDWELL.

Veronica, ST, was, according to the legend, one of the women who met Christ on his way to Calvary, and offered him her veil to wipe the sweat from his brow; when, wondrous to tell, the divine features were miraculously imprinted upon the cloth, and remained as a permanent picture of the face of the Lord. This miraculous picture is reported to have been preserved in Rome from about the year 700, and was exhibited in St Peter's on 8th December 1854. Milan and other places, however, dispute with St Peter's the possession of this most sacred relic; and many Catholic writers have supposed that the name 'Veronica' is but founded on an erroneous application of what was meant to designate not the personage, but the picture, which was called *vera icon* (Gr. *eikōn*), 'the true image' (i.e. of Christ). *Berenice*, however, is in the Clementines the name of the daughter of the Canaanitish woman healed by Jesus, with whom also Veronica (perhaps a form of the same name) has been identified. The Bollandist legend does not seem to be older than the 15th century. See Karl Pearson's monograph *Die Fronica* (Strasb. 1887), and *Dublin Review* (1885).

Verres, Roman proprætor in Sicily (73–71 B.C.), infamous for extortions which desolated the island. The inhabitants committed the care of his prosecution to Cicero, who had been quæstor in Sicily in 75. The orator collected his evidence in fifty days,

and so tremendous was its weight that his opponent Hortensius threw up the cause after the first day. Verres did not wait for condemnation, but fled before the nine days' hearing of evidence was over. He found shelter at Marseilles, but nemesis reached him in proscription by Antony (43), greedy for his art-treasures.

Verrocchio, ANDREA DEL, goldsmith, sculptor, and painter, was born at Florence in 1435, and died at Venice in 1488. First a goldsmith, he became a sculptor almost equally skilled in working marble and bronze. Only one extant picture can be certainly attributed to him, a Baptism of Christ in the Florentine Academy, and in this, according to Vasari, part was by Leonardo da Vinci. Of his bronzes, 'David' and 'Unbelieving Thomas' in Florence, and the great equestrian statue of Colleoni at Venice (q.v.), are notable. See books on him by Miss Cruttwell (1904) and M. Reymond (1906).

Verrugas, a streamlet in a rocky ravine amongst the lofty mountains over and through which runs the Central Railway of Peru (see the article PERU). Over a rocky ravine stood a bridge of three iron piers (the central one 252 feet high), which, built in 1873, was swept away by a flood in 1889. Its successor, finished in 1891, has but two piers, and the lofty central span is 585 feet long.

Versailles, a city of France, capital of the dept. of Seine-et-Oise, stands on a plain 11 miles SW. of Paris by rail. A city more of pleasure than of industry, long accustomed to find its sustenance in the expenditure of a luxurious court, and subsequently a place of residence for many foreigners, attracted thither by the salubrity of the climate, the fine promenades, and the economy of living, as compared with that in Paris, it has few manufactures and little trade. The town covers a large area in proportion to its population, and is of remarkably regular construction, consisting of long and straight streets, crossing at right angles. It is the see of a bishop, and contains a public library, many palatial edifices, public fountains, spacious squares, and elm-planted avenues. The great attraction of Versailles is its palace, and the history of this structure may be said to be the history of the town. Louis XIII. built a hunting-lodge here, afterwards extended into a château. The site occupied by the palace is known to have been that of the ancient priory of St Julien. Louis XIV., who in 1679 transferred the court and seat of government here from St Germain, devoted enormous sums to its embellishment, or rather reconstruction, under the the care of Mansard, and huge numbers of workmen were employed in laying out and draining the grounds. Louis XV. altered the arrangement of the interior. Here was signed in 1783 the peace of Versailles between England and the United States. Under Louis XVI. Versailles continued to be one of the usual residences of the court down to the period of the Revolution, which great event had its beginning here in the meeting of the States-general in May 1789. At this date the population was 100,000. At the Revolution, many of the treasures of the palace disappeared, but Louis-Philippe transformed the building into a museum, to contain trophies of the victories of France. The approach to the palace is by the *Place d'Armes* and the *Cour d'Honneur*, in the latter of which are a large equestrian figure of Louis XIV. and other statues. The façade of the palace has a total length of 634 yards with 375 windows. The state apartments of Louis XIV. (with their decorations of marble, sculptures, bronzes, carvings, and paintings executed under the superintendence of Charles Lebrun), the famous Hall of Mirrors (235 feet long), the private apartments of Louis XV. and of Marie Antoinette are all notable. The collections include pictures by Van Loo, Mignard, Vernet, Delacroix, &c., sculptures by Coysevox, &c., representing various events in French history, French heroes, &c. The gardens, first laid out (1661–68) by Le Nôtre, with their broad terraces and long alleys, are imposing, but formal; the fountains are on the grandest scale. The 'Grand Trianon' (1687), a villa in the gardens, was occupied by Madame de Maintenon, Louis XV., and Napoleon I., and in its gallery the treaty of peace with Hungary was signed, 4th June 1920; while the 'Petit Trianon' (1766) is associated specially with Marie Antoinette. From the middle of September 1870 till the conclusion of peace in 1871 Versailles was the centre of all the operations of the Prussians. On 20th September King William and the Crown-prince entered the town; and on 18th January 1871 the former was proclaimed Emperor in the Hall of Mirrors. On 28th January the capitulation of Paris was signed in Versailles; after the peace it was the seat of the National Assembly and government till 1879, and headquarters of the army during the Commune. During the World War the Allied War Council met at Versailles, and the Treaty of Versailles (q.v.) between Germany and the Allies was signed in the Hall of Mirrors, 28th June 1919. The senate and chamber of deputies meet at the palace for the election of the president of the republic. Pop. (1921) 64,754.

See books by Laborde (1840), Gavard (19 vols. 1837–49), Le Roi (1868), Pératé (1904), Farmer (1906), Cazes (1910); various works by Pierre de Nolhac, including Guides to the Palace (with Pératé, 1896), to the Gardens (1905), and *Histoire de Versailles* (2 vols. 1911).

Versailles, TREATY OF, the treaty of peace concluded between the 'Allied and Associated Powers' on the one hand and Germany on the other, and signed by the German representatives on 28th June 1919 at Versailles. At the Peace Conference, which began its meetings in Paris in January 1919, the construction and drafting of the treaty was directed mainly by the five great allied powers (Great Britain, United States, France, Italy, and Japan), their representatives forming a 'council of ten.' Latterly, however, the chief authority centred in a 'council of four,' comprising President Wilson, Lloyd George, Clemenceau, and Orlando. The treaty was governed in principle by the manifesto of the 'Fourteen Points,' which President Wilson (q.v.) had outlined in January 1918 as a suitable basis for peace, and to which, with certain reservations, both sides had virtually subscribed before the declaration of the armistice. The substance of the fifteen parts of the treaty may be indicated as follows: (1) The covenant of the League of Nations (q.v.), which Wilson insisted must be an integral part of the treaty. (2) and (3) Provision for the cession of Alsace-Lorraine to France, and Eupen, Malmedy, and part of Moresnet to Belgium; demilitarisation of the Rhine area from the river (including the left bank) to a line 50 miles east of it; government of the Saar basin by an international commission (see SAAR); demilitarisation of Heligoland; cession of Posen and part of West Prussia to Poland, and plebiscites to determine the boundaries in Upper Silesia and East Prussia (see CZECHOSLOVAKIA; DANZIG; MEMEL; POLAND; PRUSSIA, EAST); a plebiscite to determine the sovereignty of part of Sleswick (q.v.). (4) The surrender of all Germany's colonies and state rights and properties therein, also of treaty rights, concessions, &c., in such countries as China, Siam, Liberia, &c. (5) Rigid limitation of Germany's fighting forces, armaments, munitions, and material under interallied commissions of control; abolition of conscription. (6) concerns repatria-

tion of prisoners, and identification and care of war graves. (7) A wholly abortive section requiring the surrender and trial of the ex-German Emperor and others for war crimes. (8) Reparation to be made by Germany for the loss caused to the 'Allied and Associated governments and their nationals' by the war; Germany to repay Belgian loans, make good civilian losses, naval and military pensions and allowances, deliver over ships, live-stock, coal and coal derivatives, reconstruction material, &c. &c., and renounce her rights to numerous cables; a Reparations Commission to be constituted to assess the amount of Germany's payments.—A conference of Allied and German delegates at Spa in July 1920 apportioned the payments among the Allies as follows: France 52%, British Empire 22%, Italy 10%, Belgium 8%, Japan and Portugal 1·5%, others 6·5%. In April 1921 the Reparations Commission assessed the amount of the payments as 132 milliards of gold marks, to be paid at the rate of two milliards per annum along with 26% of German exports. This system was superseded in 1924 by the Dawes Scheme, which took regard to Germany's capacity to pay, and fixed a standard annual tribute of 2500 million gold marks, a sum liable to increase according to an index of prosperity. (9) and (10) concern the adjustment of financial and economic matters—treaties, debts, property, rights, interests, &c. (11) deals with the subject of allied aerial navigation over Germany. (12) chiefly concerns the internationalisation of the Rhine, Elbe, Oder, Niemen, and Danube; Kiel Canal to be equally open to all nations at peace with Germany; free zones for Czechoslovakia in the harbours of Stettin and Hamburg. (13) deals with the establishment of an international labour organisation. (14) The Rhine area, including the bridge-heads on the right bank, to be occupied by allied troops for fifteen years; but, if Germany is seen to be fulfilling the treaty obligations, evacuation is to take place, after five years of the Cologne zone, after ten of the Coblenz zone, and after fifteen of the Mainz zone. (15) Miscellaneous matters.

Germany received the terms in early May 1919, but did not signify her acceptance till the end of June. Upon the exchange of ratifications, the treaty came into force on 10th January 1920. The United States refused to ratify it (see UNITED STATES, *History*).

There is an official edition (1920) of the treaty with some other matter, and an edition by H. W. V. Temperley (1920), who also edited the *History of the Peace Conference* (6 vols. 1920–4). See also books by Dillon (1919), Tardieu (1920), and J. M. Keynes, *Economic Consequences of the Peace* (1919). For the treaty with Hungary see TRIANON.

Verse. See METRE, RHYME.

Versecz. See VRŠAC.

Verst, a Russian measure of length, containing 3500 English feet, and so nearly equal to two-thirds of a mile.

Verstegan, RICHARD (died about 1635), author and printer, was the descendant of a family from Guelderland settled in England, was educated at Oxford, but after becoming a Catholic established himself at Antwerp as a printer. He was an accomplished Old English scholar. Of his works the best known are *Theatrum Crudelitatum Hæreticorum* (Antwerp, 1587; often republished), with copperplates showing the hanging, quartering, &c., of the Catholic martyrs by the Protestants; *Odes in Imitation of the Seven Penitential Psalms* (1601); and *A Restitution of Decayed Intelligence in Antiquities* (1605), a work showing much erudition, and containing some quaint and ingenious speculation.

Vertebrata. In popular as well as in more exact classification it has been long recognised that mammals, birds, reptiles, amphibians, and fishes have certain important characteristics in common which distinguish them from molluscs, insects, crustaceans, worms, and other animals of simpler type. Yet it was not until 1797 that the distinctive characteristics were stated with some precision by Lamarck, who drew a firm line between 'backboned,' or vertebrate, and 'backboneless,' or invertebrate, forms. During the 19th century anatomists and embryologists have made the distinctions which Lamarck pointed out yet more precise, and the more important characteristics may be summed up as follows. (1) In vertebrates the central nervous system, viz. the brain and the spinal cord, lies on the dorsal surface of the body, and is tubular in structure. (2) In all young vertebrates there is formed along the dorsal surface of the gut, and therefore of hypoblastic origin, a supporting rod or notochord, which in the simpler forms may persist throughout life, but in higher forms is more or less completely replaced by the backbone—an axis developed from the mesoblastic sheath of the notochord. (3) In almost all young vertebrates several pairs of slits or clefts open from the pharynx to the exterior; in some amphibians, all fishes, and simpler forms they persist throughout life as respiratory organs, and are usually associated with feathery gills; in most amphibians they disappear during adolescence; in reptiles, birds, and mammals they are practically functionless vestigial organs, which in a few cases do not even open. (4) A great part—e.g. the retina—of the vertebrate eye arises as an outgrowth from the brain, whereas the eye of invertebrates develops as a direct insinking of the skin. (5) In vertebrates the heart is formed on the ventral surface, while that of invertebrates is dorsal. (6) Finally, vertebrates agree with annelids and arthropods among the invertebrates in being bilaterally symmetrical segmented animals. The segmentation is shown by the distribution of the nerves and ganglia, by the gill-clefts, by the series of vertebræ, by the muscle-segments and nephridia (kidney-tubes) in embryonic life at least.

But, while our knowledge of these characteristics has become more precise, it is no longer possible to draw a boundary line between vertebrates and invertebrates with a firm hand. It can no longer be said that fishes form the base of the vertebrate series, for hag and lamprey (Cyclostomata), though in many ways more primitive, are certainly vertebrates; the lancelet (Amphioxus), though perhaps degenerate, cannot be excluded from the alliance: the tunicates, though almost always degenerate in adult life, are all vertebrates in their youth, and the worm-like Balanoglossus has also certain hardly disputable vertebrate characters. In regard to the precise origin of Vertebrata there are several rival theories, but none of these has as yet found a solid foundation. Some authorities find an origin in arthropods, others in nemerteans, others in annelids, and so on; and it may be granted that it is possible to imagine from what we know of invertebrates how the characters of vertebrates might have been evolved. See the articles SPINAL COLUMN and SKELETON, and those on the several divisions of vertebrates.

Classification of Vertebrata or Chordata.

Mammals.	
Birds.	Sauropsida.
Reptiles.	Sauropsida.
Amphibians	Ichthyopsida.
Fishes	Ichthyopsida.
Cyclostomata.	
Cephalochordata (Amphioxus).	Surviving offshoots of ancestral vertebrates.
Urochordata (Tunicates).	Surviving offshoots of ancestral vertebrates.
Hemichordata (Balanoglossus).	Surviving offshoots of ancestral vertebrates.

Vertigo (dizziness, giddiness, swimming in the head) 'is that condition in which a person suffers from a sense of failing equilibrium, of falling, or of rotating.' It 'may vary from a mere uncomfortable sense of oscillation, such as one feels after landing from a sea-voyage, to a condition in which the patient is quite unable to maintain his equilibrium, and either falls to the ground or is forced to support himself by clutching some fixed object.' In its most characteristic forms the patient feels either as if he were being turned round or as if surrounding objects were being moved round him. Its direct cause is probably either (1) disturbance of the cerebral circulation or (2) abnormal sensory impressions from the semicircular canals (see EAR) or eyes, from which the chief sensations governing equilibration are derived. A familiar example of (1) is the dizziness often experienced on assuming or rising from a stooping posture; of (2) that following two or three quick turns of the body on its own axis, or rapid movement in a small circle.

(1) In disease, vertigo is met with in faintness or loss of blood, in cerebral congestion, epilepsy, and other brain diseases. It is often met with as a symptom of disturbed digestion, probably from reflex effect upon the circulation in the brain. (2) Vertigo connected with ocular disturbance generally depends upon some abnormal condition, either spasm or paralysis of one or more of the external muscles of the eyeball. It is much more commonly met with in diseases of the ear; in the cases grouped under the name of Menière's disease the semicircular canals are themselves the seat of disease; but frequently in disease of the middle ear, and even sometimes in disease of the external ear, vertigo is one of the symptoms complained of. The cause of vertigo, and therefore the treatment to be adopted in any particular case, must be decided by a careful study of the other symptoms with which it is associated.

Vertue, GEORGE, engraver and antiquary, was born in London in 1684, and, after studying under two engravers, in 1709 commenced business for himself. He was generously befriended by Kneller the portrait-painter; and his success in engraving a portrait of Tillotson at once placed him in the very front rank of his profession. In 1711, on the institution of the Academy of Painting, he enrolled himself as a member; but his contributions were few and unimportant. In his own more special department he wrought through life assiduously, confining himself for the most part to reproductions of portraits. Himself, from an early period, devoted to antiquarian research, which he prosecuted in journeys throughout England, he was appointed in 1717 engraver to the Society of Antiquaries. He died on 24th July 1756, and was buried in the cloisters of Westminster Abbey. In addition to his eminence in his art, he was a man of considerable general accomplishment; an adept in drawing and music, and with a competent knowledge of French, Dutch, and Italian. At his death his manuscripts were bought by Horace Walpole, who made free use of them in his *Anecdotes of Painting in England.*

Vertumnus. See POMONA

Verulam. See ST ALBANS, BACON.

Verwick. See WERWICQUE.

Verviers, a manufacturing town of Belgium, picturesquely situated mainly on the river Vesdre, 17 miles ESE. of Liége by rail, depends almost wholly on its cloth manufactures. Pop. 42,000.

Vervins, a small town in the French department of Aisne, 25 miles NE. of Laon. Here in 1598 an important treaty was concluded between Henry IV. (q.v.) of France and Philip II.

Verworn, MAX, physiologist, was born in Berlin, 4th November 1863, and studied there and at Jena. He became Privat-dozent at Jena in 1895, professor at Göttingen in 1901. His great work was in the physiology of the cell, summed up in his *Allgemeine Physiologie* (1895).

Vesalius, ANDREAS, anatomist, was born at Brussels, 31st December 1514, and studied at Louvain, Cologne, Montpellier, and Paris. He lectured at Basel, became surgeon to the imperial army in the Low Countries, and was professor of Anatomy successively at Padua, Pisa, Bologna, and Basel. In 1544 he became body-surgeon to Charles V., living in Madrid. He incurred great odium by opposing Galen and by dissecting human bodies; and went on a pilgrimage to Jerusalem, but died on the way at Zante, 15th October 1564. His *De Corporis Humani Fabrica* (1543) marks an epoch in anatomy and physiology. See B. W. Richardson in *Asclepiad* (1885), G. M. Cullen in *Dublin Jour. of Med. Science* (1894), and Spielmann, *Iconography of Vesalius* (1925).

Vesicants. See BLISTERS.

Vesica Piscis. See NIMBUS, and SYMBOL.

Vesoul, capital of the French department of Haute-Saône, 40 miles W. of Belfort by rail. It is surrounded by vineyards, has some trade in grain, dairy produce, leather, &c., and a pop. of 10,000.

Vespasian. TITUS FLAVIUS VESPASIANUS, the tenth of the twelve Cæsars, Roman emperor 70–79 A.D., was born of comparatively humble family near Reate, 9 A.D. He served as tribune in Thrace, as quæstor in Crete and Cyrene, in the reign of Claudius commanded a legion in Germany and in Britain, where he subdued the Isle of Wight, was consul in 51, and next proconsul of Africa, and in 67 was sent by Nero to reduce the Jews to subjection. An able soldier and honourable man, he is admitted by Tacitus even to have been 'but for his avarice equal to the generals of old days.' He was popular with his men, and when the struggle began between Otho and Vitellius he was proclaimed emperor by the legions in Alexandria, and soon after throughout all the East. Leaving the war in Judæa to his son Titus to complete, he reached Rome in 70, and soon restored the government and the public finances to order, besides showing an admirable example to a corrupt age by the simplicity and frugality of his life. After the fall of Jerusalem and his joint triumph with Titus, the temple of Janus was closed, and for nine years the wearied world had rest. Vespasian died in the summer of 79. His alleged avarice was most likely a meré wise economy, for we find him liberal enough to his subjects in distress, and to men of letters like Quintilian, as well as spending lavishly upon public works like the Colosseum (begun under him). He had a quick eye for men of virtue and capacity like Julius Agricola, whom he sent to Britain in 78. He was tolerant and good-natured, plain and blunt in manners, with a rich vein of humour which never left him to the last: 'Methinks I am becoming a god,' he whispered to the bystanders around his death-bed.

See the *Lives* of Suetonius and the *Histories* of Tacitus; but especially Dean Merivale's *History of the Romans under the Empire.*

Vespers. See BREVIARY.

Vespucci, AMERIGO, a naval astronomer, from whom America accidentally received its name, was born at Florence, March 9, 1451, and was at the head of a large Florentine firm in Seville in 1496. He fitted out Columbus' third fleet, and in 1499 himself sailed for the New World with Ojeda, and explored the coast of Venezuela (q.v.). In 1501–4

he was in the service of Emanuel of Portugal, and in 1503 discovered All-Saints' Bay, on the coast of Brazil, afterwards running south as far as Cape Frio. In 1505 he was naturalised in Spain, and from 1508 till his death, February 22, 1512, he was pilot-major of the kingdom. The accident which fastened his name on two continents may be traced to an inaccurate account of his travels published at St Dié in Lorraine in 1507, in which he is represented as having reached the mainland in 1497—before Cabot or Columbus. See his Letters (trans. Hakluyt Soc., 1894), the journal of his *Voyage from Lisbon to India* (trans. 1894), and books on him by Harrisse (1895) and Vignaud (in Fr. 1917).

Vesta, a great Roman divinity, goddess of the hearth, identified with the Greek Hestia. The latter was one of the twelve great divinities of the Greeks, daughter of Kronos and Rhea. A virgin goddess, she watched over domestic life, and had her shrine in the inner part of every house, and in the *prytaneum* of every town considered as an aggregation of families. Here, as at a private hearth, the sacred fire ever burned in her honour, and from hence it was carried by colonists to their new home. Similarly the Roman Vesta, whose worship was introduced by Numa from Lavinium, whither Æneas bore the *Penates* and the sacred fire from Troy, had her round temple in the centre of the city, where she was worshipped under the symbol of the eternal fire, watched over by the Vestal virgins. This fire was renewed on the 1st of March, and if it went out a great national disaster might be looked for. It could only be rekindled by the primitive method of friction, or, as Plutarch says, by the use of the burning-glass. The duty of the six (at first four) Vestal virgins was to keep this sacred fire burning, every day to bring water from the sacred spring of Egeria for the purification and sprinkling of the temple, to make a sacrifice of salt cakes, to offer daily prayers for the well-being of the state, and to pour on the altar of sacred fire libations of wine and oil. They also preserved the *Palladium* (q.v.) and the six other mystic symbols of the welfare of the city. They were chosen by lot out of twenty selected by the *Pontifex*, when not more than ten years of age, and took a vow for thirty years, after which time they were free to return to the world if they chose. In the first ten years the Vestal virgin learned her duties, during the second she practised them, and during the third she taught them to the young vestals. A breach of the vow of chastity was punished by burial alive in the Campus Sceleratus. Their privileges were correspondingly great; they paid no taxes, owed obedience to the Pontifex Maximus alone, could will their own property, and drive in carriages through the streets, were attended by a lictor when they went abroad, and had places of honour at all public games. They gave evidence without oath, enjoyed the privilege of burial in the Forum, and had the keeping of many documents of state. If they met a criminal by chance on the way to execution he was free. Their house, the *Atrium Vestæ*, close to the temple, was large and magnificent, and they had public slaves appointed to serve them. It was excavated only in 1883–84 (Middleton's *Anc. Rome in 1888*). Their dress was entirely white; the chief characteristic feature being the *infula*, a coronet-shaped headband with ribbons (*vittæ*) hanging from it, and covered at the time of sacrifice by a white veil (*suffibulum*). This was a white woollen hood, with a purple border, folded over the head and fastened below the throat with a *fibula*. The *Vestalia* or chief day of festival of Vesta was kept on July 9, after which the temple was closed for five days for cleaning.

See Preuner, *Hestia-Vesta* (1864); Farnell, *Cults of the Greek States* (1905–10); and the relevant parts of Frazer's *Golden Bough*.

Vestments. SACRED. The use by the priesthood of a distinctive costume in public worship formed a part not only of the Jewish, but of almost all the ancient religions. Generally speaking, in the Christian church the sacred vestments represent the original costume of Rome and the East in the first centuries, retained unaltered by the clergy, whereas in the everyday world the costume varied in fashion, in material, in colour from year to year. There seems little room for doubting that from a very early time Christian ministers employed some distinctive dress in public worship; and Catholic writers even find traces in the beginning of the 5th century of the practice of blessing the vestments which were destined for the public services of the church. The vestments used in the celebration of mass by priests of the Roman Catholic Church are the Amice (q.v., originally worn over the head); the Alb (q.v.); the girdle, a linen cord tied round the waist, and confining the folds of the alb; the maniple, a narrow strip of embroidered silk, worn pendent from the arm; the Stole (q.v.); and the Chasuble (q.v.). The three last named are always of the same material and colour; but this colour, which appears primitively to have been in all cases white, now, and for many centuries, varies according to seasons and festivals, five different colours being employed in the cycle of ecclesiastical services—viz. white, red, green, violet, and black. Cloth of gold, however, may be substituted for any of these, except the last. Bishops, in celebrating, wear, besides the vestments of priests, two inner vestments, the dalmatic and tunic (those of the deacon and sub-deacon respectively), as also embroidered gloves and shoes, or buskins, together with the distinctive episcopal ornaments—the pectoral cross, ring, mitre, and pastoral staff, or, if archbishops, the crozier. Archbishops celebrating mass also wear the Pallium (q.v.). Bishops, when they celebrate pontifically, take their vestments from the altar, whereas priests put them on in the sacristy; but this is a late distinction. In other public services priests and bishops wear the Cope (q.v.), with a pendent cape or hood. In the ministration of the other sacraments, and also in administering communion privately, priests wear the Surplice (q.v.) with the stole, or it may even be the stole alone. In the Greek Church the *stoicharion*, *zoné*, *epitrachelion*, *epimanikia* (a square piece of cloth, stiffened, worn pendent from the girdle, and perhaps originally a napkin), and ample *phelonion* correspond respectively with the alb, girdle, stole, maniple, and chasuble. Greek bishops wear the *omophorion*, which corresponds with the later pallium, and also a pectoral cross, and carry a short pastoral staff; but they wear no ring, and, except by the patriarch of Alexandria, the mitre is not worn in the sanctuary.

The natural effect of the religious changes of the 16th century was to put aside the costume at the same time and on the same grounds with the ceremonies of the existing worship. This was done, however, by the different churches of the Reformers in very various degrees. The Calvinistic worship may be said to have dispensed with vestments altogether. The Lutherans generally retained with the cassock the alb, and in some countries the chasuble. In the Swedish Church full vestments are retained. In the English Church a variety of practice has existed. See SURPLICE. As to the rest of the costume, the first Prayer-book retained the Roman vestments with little change; and as the vestments and ornaments of 1549 were again enjoined in 1559, a so-called ritualistic move-

ment in the English Church has since 1851 reintroduced in some places almost every detail of the Roman costume in the communion and other services, a revival which has in many instances been vigorously resisted. See Marriott's *Vestiarium Christianum* (1868).

Vestris, MADAME, actress, was the granddaughter of Bartolozzi the engraver, and was born in London, 7th March 1797. Accomplished in music, French, and Italian, Lucia Elizabeth Bartolozzi married at sixteen Armand Vestris, balletdancer, member of an originally Florentine family that gave to France a series of distinguished cooks, actors, and ballet-dancers. Three years later she separated from her worthless husband and went on the stage in Paris (1815), attaining fair success. In 1820 she appeared at Drury Lane, soon became famous in *The Haunted Tower*, was even more popular as Phœbe in *Paul Pry*, and in light comedy and burlesque was uniformly successful. She was lessee of the Olympic when in 1838 she married Charles James Mathews, and she afterwards undertook the management of Covent Garden and the Lyceum. She retired in 1854, and died at Gore Lodge, Fulham, 8th August 1856. See Life by C. E. Pearce (1923).

Vestry (Fr. *vestiaire*, Lat. *vestiarium*, 'robing-room' or 'room where vestments are kept;' hence a meeting held in a vestry), in English parishes a meeting of all the ratepayers, assembled on three days' notice, to elect parish-officers—churchwardens, overseers, a vestry-clerk, and, if need be, a collector of rates—to assess church-rates, and to manage the property of the parish. The vestry had also the right to adopt the Free Libraries Act, the Lighting and Watching Act; but most of its powers were taken away by poor-laws, laws as to public health, and especially the Local Government Act of 1894—since which the vestry in rural parishes exists for ecclesiastical purposes only, and in urban parishes its powers may by an order be transferred to the urban district council. The incumbent is chairman of the vestry; the voting is by show of hands, but if a poll is demanded the ratepayer has votes in proportion to his rates. See PARISH, CHURCH-RATES, CHURCHWARDENS, POOR-LAWS.

Vesuvian, or IDOCRASE, a mineral composed essentially of silica (37 to 39 per cent.), alumina (13 to 16 per cent.), and lime (33 to 37 per cent.), and containing a small percentage of water and usually some oxide of iron. It occurs both massive and crystallised—the general form of the crystals being that of a rectangular prism terminated by faces of the protopyramid and basal planes. The edges of the prisms are often replaced. The hardness = 6·5, and specific gravity = 3·34 to 3·45. The mineral has a vitreous and sometimes resinous lustre, and varies in colour from brown to green; but is occasionally yellow, azure blue, or black. It was first found in dolomitic blocks ejected from Vesuvius and Somma, but occurs in granular limestone, serpentine, gneiss, and other rocks in regions where crystalline schists abound. It is often associated with garnet, pyroxenes, epidote, &c. Owing to the fact that the crystals are usually of insufficient transparency, idocrase is rarely used in jewellery.

Vesuvius, the most striking object seen from the Bay of Naples, is an active volcano which has been studied for so long and so thoroughly that it is perhaps the best known volcano in the world, serving as a type for the popular conception of such a mountain. It is encircled on the north and east by a lofty cliff, Monte Somma, which indicates the site of a much larger prehistoric volcano. (See VOLCANOES.) The latter—the Mons Summanus of antiquity, once crowned by a temple of Jupiter—was the seat of volcanic activity long before Vesuvius, which first (63 A.D.) became convulsed by earthquakes, repeated at intervals till 79, in which year occurred its earliest known eruption (see POMPEII). This was followed by others, of which the more memorable are that in 472, when its ashes alighted in Constantinople; in 512, when they were wafted to Tripoli; in 1036; and in 1500; after which ensued a period of inaction, broken in December 1631 by a destructive outbreak which denuded the mountain of the forest-growth with which it had become clothed. The 18th century witnessed many of its eruptions, the most remarkable being that of 1793, when a lava-stream 12 to 40 feet thick swept over Torre del Greco and penetrated the sea to a distance of 380 feet, by which time its volume was 1204 feet wide and 15 feet high. This stream was so liquid that to leave the crater and enter the sea—a journey of 4 miles—it took only six hours. Another memorable outbreak was that of 1822, when the so-called 'smoke' from the crater rose to a height of 10,000 feet, emitting flashes of lightning, raining torrents of hot water, and flooding the villages of S. Sebastiano and Massa. In 1855 occurred a terrible eruption, in which the summit of the cone discharged a lava-stream which ravaged the fertile and highly-cultivated region below. On December 8, 1861, Torre del Greco suffered severely from another visitation, surpassed in turn by that of 1871–72, when the sudden emission of lava from a crater of 1855 killed twenty spectators on the spot. The eruption of April 7–10, 1906, and following days was more formidable than that of 1872; the principal lava stream ran towards Torre Annunciata. Ottajano and San Giuseppe were overwhelmed with dust, ashes, and scoriæ. Even at Naples the weight of dust was sufficient to crush in the roof of a market; over a considerable area it varied from 3 inches to a yard in depth, and seems even to have reached Bari. The top of the crater rim was removed, and the outline of the mountain has been far less picturesque ever since. According to Palmieri: (1) The filling up of the crater portends an imminent eruption, and its full discharge is followed by a period of repose. (2) The narrowing of the mouth of the crater by accumulated debris impedes the flow of the lava, and this impediment leads to the outburst of lateral openings which from their greater proximity to the source of heat emit the lava in a more liquid condition, whereby its flow becomes that of a continuous stream. (3) When the internal channel is blocked by solid debris, the effort of the elastic vapour to clear it is supposed to cause the earthquakes by which the greater eruptions are preceded and accompanied. (4) What is called 'smoke' from the crater is simply steam more or less blackened with incinerated dust. When this dust is in excess it accelerates the fall of the steam, which, having become water by condensation, descends like a mud-torrent, flooding the ground. This was a notable feature of the visitation in which Pompeii perished. (5) During an eruption what appears as flame shooting out of the crater is really the reflection of the molten lava within the crater upon the steam and upon the ashes suspended in the steam accumulated above it. (6) The rapid condensing of vapour into water, and the conversion of this into steam, generates electricity, which explains the lightning-effects visible on the edges of the clouds overhanging the crater. Vesuvius is reckoned by geologists the most instructive object-lesson on volcanoes in general, and the university of Naples, by an admirable assortment of specimens of its structure, has greatly facilitated its study. Professor Sacchi numbers forty species of minerals found in it, of which augite, hornblende, mica, sodalite, breislakite,

magnetic iron, and leucite are the most abundant. The fertility of its slopes, since Martial's famous epigram on the destruction of Pompeii, has passed into a proverb, its chief product being the wine called Lacrimæ Christi, red and white, the latter superior in bouquet. Its observatory (1841) has acquired a European reputation from the meteorologist Melloni, and still more from his successors, Palmieri (1852–82) and Matteucci, who directed it with equal sagacity, skill, and daring. The funicular railway from the base to near the summit was opened in 1880. It takes visitors almost to the mouth of the crater.

See John Phillips's *Description of Vesuvius;* the papers of Dr Johnston-Lavis; and J. S. Lobley, *Mount Vesuvius: Historical and Geological Account* (1889).

Veszprém, a Hungarian city, 60 miles S. of Budapest, in a fruit-growing district. It has a 14th-century cathedral and a pop. of 15,000.

Vetch (*Vicia*), a genus of plants of the family Leguminosæ, sub-family Papilionaceæ, having a tuft of hairs on the style beneath the stigma, nine stamens united, and one free. To this genus the *Bean* (q.v.) is referred by the authors of the *Genera Plantarum*, an arrangement not generally adopted by botanists. The species, however, are mostly climbing plants, annuals, with pinnate leaves ending in tendrils, and with no terminal leaflet. A number of species are natives of Britain. The Common Vetch (*V. sativa*), sometimes called by agriculturists Tare, frequent in cultivated ground in Britain and throughout Europe, and itself much cultivated as green food for cattle, has rather large purple, blue, or red flowers in pairs, axillary and almost sessile. In cultivation it varies considerably both in size and other particulars, as in the breadth of the leaflets, the number of them in a leaf, &c. Oats are sometimes sown along with it, to afford it a little support, and thus prevent its rotting in wet weather. *V. Cracca* and *V. sepium* are very common British species, the former with many-flowered stalks, bearing beautiful bluish-purple flowers, being one of the most beautiful climbing plants, and a chief ornament of hedges and bushy places in the latter part of summer. These and other species, natives of Britain or of different parts of Europe and the north of Asia, have been either occasionally cultivated as food for cattle or recommended for cultivation, and generally agree with the Common Vetch both in their qualities and in the mode of cultivation which they require. *V. biennis* and *V. narbonensis* are amongst those chiefly cultivated in some parts of Europe. The species of vetch are very numerous, chiefly in the temperate parts of the northern hemisphere. For the Vetchling and Bitter Vetch, see LATHYRUS. The name of Milk-vetch is given to plants of the genus Astragalus.

Common Vetch (*Vicia sativa*): *a*, seed-pod.

Veterinary Medicine. The ancients—more particularly Homer and Xenophon—wrote about horses and their management; Virgil's *Georgics* show close observation of the domestic animals and their ailments; and the Latin term *veterinarius* is as old at least as the 1st century A.D. Hippocrates, the father of medicine, wrote a treatise on the veterinary art; but its true founder was Vegetius, who wrote *De Arte Veterinaria*, 300 A.D. This work became the oracle of succeeding ages. He was sufficiently liberal-minded to give due credit to Columella and other writers who had preceded him. For many centuries after Vegetius but few writings are known to have appeared, and of these but few extracts now remain, collated by order of Constantine Porphyrogenitus. To a somewhat later date may belong the first application of iron shoes to horses' feet, and the maker of the shoes was entrusted with the medical care of the horse; hence the term *farrier*, 'a worker in iron,' still sometimes given to the veterinarian.

In the 16th century the necessity for a higher cultivation of the veterinary art appeared evident, and Francis I. ordered Constantine's collection to be translated from Greek into Latin by Ruel (Ruelle), a physician. From Latin it was soon translated into Italian, French, and German, and became dispersed over Europe; nearly at the same time the works of Vegetius appeared in several languages, and from this period the art made gradual progress. Gessner compiled from Aristotle, Pliny, Columella, Vegetius, and others; soon after Laurentius Ruffius wrote some celebrated works in Latin; and later on appeared the *Natural History of the Ruminantia* and the *Phenomena of Rumination* by Emiliano. During the 17th century the art continued to advance, and numerous treatises were written upon it, the most notable being Cæsar Fiarchi's work on horsemanship, in which is introduced the most rational mode of horseshoeing then practised—he condemned the use of calkings. Carlo Ruini (Bologna, 1598) published the *Infermità del Cavallo, e suoi Remedii*, from which Snape and Gibson in England, and most of the French authors, have copied their anatomical plates. In 1654 the *Grand Mareschal François*, said to be composed by several authors, appeared, and in the latter end of the century Solleysel published an elaborate work. Solleysel, riding-master to the king of France, opposed many abuses, exposed the folly of burning the lampas—a cruelty practised even to this day—reprobated bleeding from the palate in fever, &c. He was extensively copied.

But the first attempt to elevate the art into a science occurred in 1761, when France set the example of establishing the first veterinary college under royal patronage at Lyons, the first professor being Bourgelat, who wrote numerous anatomical and medical works bearing on the infant science. Shortly afterwards (1766) a second school was established at Alfort near Paris, to which Bourgelat was transferred. Both of these colleges are still flourishing, and establishments of a similar kind were organised in the capitals of almost every European country, including London. Contemporary with Bourgelat flourished the elder La Fosse, who made numerous discoveries and improvements, usually communicated in the form of memoirs to the Academy of Science in Paris. In 1754 these memoirs were published in one volume, which was quickly translated into other languages. His son proved a worthy successor to the illustrious father, in 1766 publishing his *Guide de Maréchal*, and in 1772 his greatest work, the *Cour d'Hippiatrique;* it contains sixty-five anatomical plates coloured after nature, with concise descriptions in letterpress. He afterwards published his *Dictionnaire d'Hippiatrique* in 4 vols. After the death of Bourgelat and the two La

Fosses no great progress was made until after the Revolution, when the names of Hartman, Chabert, Huzard, and others stand prominently forward.

Reverting to the history of the art in Britain, we find that Thomas Blundeville (fl. 1561) was one of our earliest authors. He was succeeded by Mascal, Martin Clifford, and Burdon, and at this time Gervase Markham wrote his well-known but absurd *Treatise on Farriery*. In the time of Charles II. Snape's *Anatomical Treatise on the Horse* appeared. In the reign of George I. Solleysel's treatise was translated by Sir William Hope. About the middle of the 18th century appeared the works of Gibson, Bracken, Bartlet, Osmer, Taplin, and others. The majority of these writers were entirely ignorant of the *nature* of disease; in fact they were men of *recipes* and infallible cures, having but little knowledge of anatomy, physiology, or the allied sciences, although many of them were members of the medical profession; consequently glanders, farcy, blindness, pole-evil, &c. were rampant. The diseases of cattle were but little studied; hence the loss of animal life was very great. The importance of a more extended knowledge of the art as a science now began to be felt in England, and the Odiham Agricultural Society in 1791 formed the Veterinary College of London, with M. St Bel as professor. St Bel, a Frenchman who had studied under Bourgelat, died in 1793.

The professorship was now accepted by Coleman, a young surgeon, a friend of Sir Astley Cooper, Abernethy, Cline, Babington, and other eminent men. He paid great attention to sanitation and the prevention of diseases. Against the prevailing opinion he recommended fresh air in the treatment of lung diseases, and his ideas on ventilation were soon justified by marked decreases in such diseases as glanders and periodic ophthalmia. Coleman was assisted by a practical veterinarian named Moorcroft, who, however, withdrew and became eminent in India. Great interest was taken in the college and its work by John Hunter, Cooper, and others. Coleman was succeeded by Sewell, who recommended the frog-seton—a useless and barbarous practice—in navicular disease and excision of the nerve in chronic foot lameness. Delabere Blain, Percival, and Youatt were good anatomists, but, like their immediate predecessors and contemporaries, they advocated the heroic method of treatment. In fact the complicated but harmless recipes of past authors were thrown aside, and bleeding, physicking, and blistering were fully brought into operation. Sewell was succeeded by Spooner, who was followed by Simonds. After Sewell the heads have been Simonds, Spooner, Robertson, Brown, and McFadyean.

In 1844 a royal charter recognised the veterinary surgeon's art as a profession, and granted to members of the Royal Veterinary College of London and of the Veterinary College of Edinburgh a charter constituting them a body corporate to be known as the 'Royal College of Veterinary Surgeons.' The council of this body now possesses powers to regulate the teaching, subjects of examination, &c., of the various colleges which are incorporated under the charter. The schools recognised by the charter are as follows: The Royal Veterinary College, London, founded 1791; the Royal (Dick) Veterinary College, Edinburgh, founded 1823; the Veterinary College, Glasgow, founded 1863; the Veterinary School, the University, Liverpool; the Royal Veterinary College of Ireland, Dublin. Each of the above noted colleges possesses a full staff of lecturers and demonstrators in the various departments. It was originally possible, in the London college, to obtain a diploma in veterinary medicine in a few months, but in order now to be enrolled a member of the Royal College of Veterinary Surgeons it is necessary that a student shall pass a preliminary examination, spend four scholastic years in one of the recognised schools (or three years for graduates under certain conditions), and also pass four professional examinations. London and Edinburgh Universities grant the degrees of B.Sc. and D.Sc. in veterinary science, and Liverpool University degrees of bachelor, master, and doctor of veterinary science. In addition to the above teaching centres there are lectures in veterinary hygiene by qualified veterinary surgeons in the agricultural colleges, to give the students a knowledge of the best methods of keeping stock healthy and the treatment of minor diseases.

In the later half of the 19th century veterinary colleges were founded in the United States, in the principal British colonies, and in India. The first college established in Canada is the Ontario Veterinary College at Toronto; and in 1866–1902 there was in Montreal a college, later a faculty of McGill University. In Australia colleges have been instituted, and in India several schools are now in working order, presided over by army veterinary surgeons. The American Veterinary College at New York was incorporated and organised in 1875. Many of the American universities have created faculties of veterinary medicine, the best known of these being that of Harvard; others are those of Minnesota, Cornell, and Ithaca.

See articles on the various diseases of animals.

Vetiver, the dried roots of the cuscus or khaskhas grass, an Indian Andropogon (*A. muricatus*; see LEMON-GRASS, GRASS-OIL), which has a very agreeable and persistent odour, something like sandalwood. Baskets, fans, and mats are made of it.

Veto (Lat., 'I forbid'), in Politics, the power which one branch of the government of a country may have to negative the resolutions of another branch. In the United Kingdom the power of the crown in the act of legislation is confined to a veto. The crown cannot of itself make any alterations in the existing law, but may refuse to sanction alterations suggested and consented to by the two houses of parliament. The royal veto is reserved for extreme emergencies; the last instance in which it was exercised was in 1707, when Queen Anne refused her assent to a bill relating to the militia in Scotland. Governors of colonies have a similar power. The House of Lords may reject (and so for a time veto) bills passed by the Commons. This power was greatly curtailed by the Parliament Act of 1911 (see PARLIAMENT). The question as to a British veto on Irish legislation was one of the difficulties in the scheme of Home Rule for Ireland. In the United States of America the president has a qualified right to veto all laws passed by congress; but after that veto has been exercised the bill which he has rejected may become law by being passed by two-thirds of each house of congress. The same rule applies in most of the states, a two-thirds vote in both branches of the legislature passing a bill over the governor's veto. In others the proportion is three-fifths, and in several a simple majority suffices. The president's power of veto was in the earliest days of the republic very sparingly used, but is now resorted to with comparative frequency; while, as an extreme instance, in the state of New York, with a demoralised legislature, no less than 236 bills were vetoed by the governor in one session. The Swiss *referendum* includes the power of veto (see INITIATIVE AND REFERENDUM, SWITZERLAND). For the Polish *liberum veto*, see POLAND, p. 257. In revolutionary France in 1795 a Council of Ancients was created, with a power to veto the resolutions of the legislative body. For the Veto Act in the Scottish Church, see SCOTLAND

and FREE CHURCH. The veto is sometimes a name given to total prohibition in temperance legislation; see LIQUOR LAWS, LICENSING LAWS, TEMPERANCE.

Vetter, or WETTER, LAKE, after Lake Vener the largest lake in Sweden, lies in Götaland, 25 miles SE. of Lake Vener. It is 76 miles long, 18 miles in average breadth, has an area of 730 sq. m., is 380 feet in greatest depth, and is 281 feet above the level of the Baltic. It receives about ninety small tributaries, and has an outlet in the Motala River, which, flowing eastward, maintains the communication of the lake with the Baltic. It is fed mainly by springs from beneath. Its waters are clear, and of a beautiful green colour, and it is surrounded by lofty romantic shores, almost unbroken by bays. It is remarkable for an irregular alternation of risings and fallings, and for an occasional violent undulation in perfectly still weather. An intricate chain of small lakes, continued westward by the Göta Canal, connects it with Lake Vener, and thus with the Kattegat. Lake Vetter contains few islands.

Veuillot, LOUIS, publicist, born in 1813 at Boynes (Loiret), chose the profession of journalism, and filled several engagements on the provincial press. He visited Rome in 1838, returned to Paris a zealous adherent of the papacy, and, as editor of the *Univers*, soon signalised himself as an aggressive and uncompromising champion of the church. In 1842 he accompanied Marshal Bugeaud to Africa as his secretary, and on his return was made Chief-secretary to the Ministry of the Interior. He again edited the *Univers* in 1848; but his attacks on Napoleon III. led to the suppression of his paper from 1860 till 1867. During the Vatican Council he was a vehement supporter of Ultramontanism. Veuillot, besides polemical pieces, wrote novels, poems, books of travel. He died 7th April 1883. See Life by Tavernier (1913).

Vevey (Ger. *Vivis*), a Swiss town in the canton of Vaud, a favourite health-resort, remarkable for the beauty of its situation on the north shore of the Lake of Geneva, 11 miles E. of Lausanne by rail. It stands at the mouth of the gorge of the Veveyse. From the elevations about the town the fine view to the east commands the valley of the Rhone, backed by the magnificent rampart of the Alps of Valais. In the church of St Martin, Ludlow, one of Charles I.'s judges, and Broughton, who read to him his sentence of death, are buried. There is considerable trade in chocolate, milk, cheese, and wine; and cigars are largely made and exported. Pop. (1920) 12,768.

Vexilla Regis. See HYMN.

Vézelay, a decaying town in the French dept. of Yonne, 5 miles SE. of Auxerre. Its ancient and splendid abbey church, damaged by the Huguenots and at the Revolution, was restored by Viollet-le-Duc in 1868. Here St Bernard preached the Crusade in 1145; hither Becket retired in 1168; and on the plain below, Richard Cœur de Lion and Philip Augustus joined their forces in 1190 for the third crusade. Beza was a native.

Viaduct. See BRIDGE.

Via-Mala, a remarkable gorge in the Swiss canton of Grisons, on the course of the Farther Rhine (see RHINE). The roadway (1823) is carried for about 3½ miles partly along ledges hewn out of the precipice, partly in a tunnel; the rock-walls rising to 1600 feet, and sometimes but a few feet apart. The road crosses the river three times by bridges, and is about 160 feet above the river.

Via Media. See NEWMAN.

Vianna, a seaport of Portugal, at the Lima's mouth, 45 miles N. of Oporto by rail. Pop. 10,000.

Viardot. See GARCÍA.

Viareggio, an Italian town on a beautiful site on the Mediterranean coast, 13 miles NW. of Pisa by rail. Malarious swamps have been drained, and great pine-woods shelter a health-resort, both in winter and summer, when the sea-bathing attracts many visitors. Here Shelley's body was cast ashore in 1822. There is a small harbour at the mouth of the Burlamacca canal, which drains the little lake of Massaciuccoli, mainly used by fishermen. Pop. of commune (1921) 27,618.

Viaticum (Lat., 'provision for a journey'), Holy Communion administered to persons in danger of death. It may be received without fasting (as is required in all other cases) from the midnight previous; and it may be given frequently during the same sickness.

Viatka. See VYATKA.

Viaud, LOUIS-MARIE-JULIEN. See LOTI (PIERRE).

Viborg (Finnish, *Viipuri*), capital of a department in the SE. of Finland, on an inlet of the Gulf of Finland, 75 miles NW. of St Petersburg, with many ancient and historical buildings, some manufactures, and a large export trade through its harbour, Transund (Uuraa), 8 miles away. Near Viborg is the mouth of the Saima canal, which joins the great Saima water-system with the Gulf of Finland. Pop. 47,000, including many Swedes.

Viborg, a picturesque old city of Denmark, on a small lake, 45 miles NW. of Aarhuus; pop. 15,000. Its 12th-century cathedral was rebuilt in 1726, and restored in 1875.

Vibrio, a name given with much laxity to various kinds of more or less screw-shaped Bacteria (q.v.); also to small nematoid worms, such as cause ear-cockles in wheat.

Viburnum, a genus of plants of the family Caprifoliaceæ, having a five-toothed calyx, a five-lobed, wheel-shaped, bell-shaped, or tubular corolla, five stamens, three sessile stigmas, and a one-seeded berry. The species are shrubs with simple leaves, natives chiefly of the northern parts of the world; but Formosa has several species, and Madagascar and South America have some. *V. Opulus* is the Guelder Rose (q.v.), or Snowball Tree, and *V. Tinus* is the Laurustinus (q.v.), both well-known ornamental shrubs. *V. Lantana*, sometimes called the Wayfaring Tree, is a native of the warmer temperate parts of Europe and Asia, not unfrequent in England, and often planted as an ornamental shrub. It is a large bush or low tree, with large elliptic serrate leaves, downy, with star-like hairs on the under side. The young shoots are very downy. The flowers are small and white, in large dense cymes; the berries purplish black, mealy, and mucilaginous, with a peculiar sweetish taste. The word *viburna*, from which the name is derived, was used by the ancients to denote any plant the branches of which were pliable and suitable for tying; some of the species are adapted by the toughness and pliability of their branches for that purpose.

Vicar (Lat., 'delegate'), in England, a parson of a parish where the tithes are impropriate (see IMPROPRIATION). In ecclesiastical usage the title is given to those who hold authority as the delegates or substitutes of others. A *vicar-apostolic* (formerly one to whom the pope delegated some remote portion of his jurisdiction) is now usually a titular bishop appointed to a country where either no sees have been formed or the episcopal succession has been broken. *Vicars-forane* are ecclesiastics to whom a bishop gives a limited jurisdiction in a town or district of his diocese—in effect, rural deans. *Vicars-general* in the Roman Catholic Church perform the work of archdeacons. They

must be clerks, not laymen, but need not be in holy orders. *Vicars-choral* are assistants, cleric or lay, of the canons and prebendaries in the public services and music; they form a distinct corporation in English cathedrals of the old foundation, in twelve Irish cathedrals, and in St David's.

Vice-chancellor. See CHANCERY, CHANCELLOR.

Vice-consul, a subordinate officer, to whom consular functions are delegated in some particular part of a district already under the supervision of a consul. A British vice-consul is selected by the consul under whom he is to act, and his name is transmitted for approval to the Secretary of State for Foreign Affairs. The vice-consul acts under the general supervision of the consul, corresponding with him in ordinary cases, but in some special cases with the Foreign Office. A consul is not at liberty to dismiss a vice-consul acting within his district without the sanction of the Foreign Secretary. See CONSUL (MERCANTILE).

Vicente. See GIL VICENTE.

Vicenza, the capital of an Italian province, is situated at the confluence of the rivers Bacchiglione and Retrone, 42 miles W. of Venice by rail. Pop. of commune (1921) 60,267. The older part of the town is surrounded by a moat, but an outer line of walls (now in the main destroyed) was constructed at a later date. From an architectural point of view it is one of the most interesting cities in Italy, and while it contains numerous churches and palaces in the Venetian, Gothic, and early Renaissance styles, it is mainly famous for the buildings designed by Andrea Palladio (q.v.; 1518–1580), a native of the town, and his imitators and successors, especially Vincenzo Scamozzi (1552–1616). Such are the Basilica Palladiana, which encloses the Gothic Palazzo della Ragione; the Palazzo Chiericati, containing the town museum, with interesting pictures; and the Teatro Olimpico, begun in 1580, and finished by Scamozzi after Palladio's death, which is constructed in wood and stucco and is in imitation of an ancient theatre; it was inaugurated in 1585 with a performance of Sophocles' *Œdipus Rex;* in 1908 Gustavo Salvini gave the *Oresteia* there. The municipal palace is the chef d'œuvre of Scamozzi. To the Gothic period belong the cathedral (the left side portal and the dome were designed by Palladio), the Franciscan church of S. Lorenzo, and the Dominican church of S. Corona, all containing interesting pictures and works of art of various periods; the splendid Palazzo da Schio, and other palaces of less note; and the lofty, slender campanile in the Piazza dei Signori, known as the Torre di Piazza, originally dating from the 12th century, but added to in 1311 and 1444. To the south is the Monte Berico, with the church of the Madonna del Monte, approached by a portico 700 yards in length, and commanding a fine view of the town. Here are the Villa Valmarana, with famous frescoes by G. B. Tiepolo (1737) and his son, and the celebrated Rotonda, one of Palladio's finest works. The whole of the surrounding country is exceedingly beautiful; the plain is studded with villas and country houses, and is richly cultivated; and behind are the mountains, which, as far as the old Austrian frontier, are included in the province of Vicenza. The Sette Comuni, or seven village communes, formerly German settlements (like the Tredici Comuni, north of Verona), which for a time formed a republic under Venetian protection, were situated on the plateau of Asiago, but were devastated in the Great War. The province has some important marble and kaolin quarries, and paper-mills; while of the various woollen mills the most important is at Schio.

Vicenza (anc. *Vicetia*) became Roman in 177 B.C., and was a town of some importance under the empire, until it was laid waste by Attila in 452 A.D. Its prosperity revived under the Goths; it successively became a Lombard duchy and a Frankish county. Otho III. invested its bishop with civil jurisdiction over it in 1001; but the tyranny of his successors provoked an insurrection, and the city became independent. It was, however, taken by Frederick II. in 1236, and after passing under various rulers, including the Scaligers of Verona, it finally fell under the dominion of Venice in 1404, and followed the fortunes of that city. Antonio Pigafetta (1491–1534), a companion of Magellan in his circumnavigation of the globe, and, in more recent times, the novelist Antonio Fogazzaro (1842–1911), were natives of Vicenza.

Vice-president. See PRESIDENT.

Viceroy, a title popularly given to any officer who is delegated by a sovereign to exercise regal authority in his name—as the Governor-general of India, the former Lord-lieutenant of Ireland. See also KHEDIVE.

Vich, or VIQUE, a Spanish city, 40 miles N. of Barcelona by rail, with a modernised cathedral (see SERT), and some manufactures. Pop. (1920) 13,361.

Vichy, a small town in the heart of France, dept. Allier, stands on the Allier, in a fine valley surrounded by hills clad with vines and fruit-trees, 30 miles SSE. of Moulins by rail. Vichy is the most frequented watering-place in France. The springs which rise at the foot of the volcanic mountains of Auvergne (q.v.) are of the alkaline class, somewhat acidulous, and the most efficacious of the kind that are known. They vary in temperature from 54° to 113° F., are used both for drinking and bathing, and are resorted to in cases of indigestion, chronic catarrh, gout, and especially liver disorders (see MINERAL WATERS). Millions of bottles of Vichy water are exported annually. The virtues of the *aquæ calidæ* of this place were known in Roman times, as is testified by the remains of marble baths and coins that have been dug up; but their modern repute arose only in the 19th century, being greatly promoted by the visits of Napoleon III. The season lasts from May to mid-October. Pop. 17,500.

Vicious Intromission. See INTROMISSION.

Vicksburg, the largest city of Mississippi, stands on a high, uneven bluff above the Mississippi River, 235 miles by rail NNW. of New Orleans. The shipping trade in cotton is very large, and there are iron-foundries, factories, &c. The place was strongly fortified by the Confederates during the civil war, and repulsed several attacks; but after a siege by land and water from 18th May 1863, it was surrendered to Grant on 4th July, with nearly 30,000 men. Pop. 18,000.

Vico, GIOVANNI BATTISTA, jurist, philosopher, and critic, was born, the son of a bookseller, at Naples, 23d June 1668, studied law at the university, but devoted himself to literature, history, and philosophy, and, after serving as tutor to the nephews of the Bishop of Ischia for nine years, became in 1697 the professor of Rhetoric at Naples. To this poorly paid appointment was added in 1735 the post of historiographer to the Bourbon king, Charles III. of Naples. He struggled most of his life with poverty and latterly with ill-health, and died 20th January 1744. His great work is his *Scienza Nuova,* of which the first edition appeared in 1725, but the work was completely recast in the second edition of 1730. A third edition appeared in 1744 after its author's death. The work is a treatise of the history of civilisation

and of the evolution of law, and in virtue of it he is reckoned the founder of the philosophy of history (see SOCIOLOGY, pp. 490–91). Though profoundly influenced by Bacon and Grotius, he differs widely from either of them, deriving law from conscience and conscience from the inspiration of God; God's providence is the basis of history. He also published orations, minor works, and a discourse on universal law. As a critic he anticipated Wolf in holding that Homer was not one but many poets.

There are editions of Vico's works by Ferrari (1835–37) and Pomodoro (1858–69), and a full selection by Michelet (Paris, 1835). See Studies by Cantoni (Turin, 1867), Flint (1884), and B. Croce (1911; trans. 1913).

Victor, CLAUDE PERRIN, Duc de Belluno, and marshal of France, was born at La Marche (Vosges), 7th December 1764, and at seventeen enlisted in a regiment of artillery, and served eight years as a common soldier. He re-enlisted in 1792, and rose rapidly; for his conduct at the siege of Toulon in 1793 he was made general of brigade. He served with distinction in the Italian campaigns, especially covering himself with glory at Montebello and Marengo. Napoleon gave him the marshal's baton on the bloody field of Friedland (1807), and later the title of Duke of Belluno. From 1808 till 1812 he commanded the first corps d'armée in Spain, and lost the battles of Talavera and Barrosa. He commanded the ninth corps d'armée in the fatal Russian campaign, and covered the crossing of the Berezina. He fought at Dresden and Leipzig, lost the emperor's favour by neglecting to occupy the bridge of Montereau-sur-Yonne, and was severely wounded at Craonne. Louis XVIII. gave him the command of the second division, and to his shame the presidency of the military commission appointed to try such of his old companions in arms as had deserted to Napoleon during the 'Hundred Days.' He was minister of War from 1821 to 1823, and died at Paris, March 1, 1841. *Mémoires Inédits* was published in 1846.

Victor Amadeus. See SAVOY.

Victor Emmanuel II., the first king of a united Italy, was the son of Charles Albert (q.v.) of Sardinia, and was born March 14, 1820. (For Victor Emmanuel I., king of Sardinia, see SAVOY.) He early showed military ardour, and in command of the brigade of Savoy in the campaign of 1848–49 displayed great gallantry at Goito and Novara. On the evening of the latter battle his father, unwilling to bow to the onerous conditions offered by Radetzky, abdicated in favour of Victor Emmanuel, who, being the husband of the Austrian Archduchess Adelaide, and uncommitted to the views of the Italian Ultra-democrats, might hope to obtain more favourable terms from the victor. Victor Emmanuel thus ascended the throne of Sardinia, March 23, 1849. The events of his reign, his policy and that of his ministers, Azeglio, Cavour, and others, issuing in the reconstitution of the kingdom of Italy under the Sardinian dynasty, is already treated at ITALY. The king, who was an excellent soldier and statesman, but had also able advisers, reigned as a strictly constitutional monarch, and retained to the last the simple tastes of a hardy (but not ascetic) mountaineer and huntsman. The 'Re Galantuomo,' as his people fondly called him, died January 9, 1878, and was buried in the Pantheon. He was succeeded by his son Humbert. His daughter Clotilde was, for the sake of the French alliance, but rather against the king's will, married to Prince Napoleon (see BONAPARTE). See Life by Forester (1927).

Victoria, the smallest mainland State of the Australian Commonwealth (the island Tasmania is still smaller), lies in the south-eastern corner of Australia. It is bounded on the west by the 141st meridian—which divides it from South Australia—and on the north by the southern bank of the river Murray and by a straight line drawn from the source of the Murray to Cape Howe. On the east and south its limits are the Tasman Sea and Bass Strait. Its total area is 87,884 sq. m. Both the land boundaries have a history of their own. The actual western border-line lies about 2¼ miles west of the meridian that is supposed to coincide with it; the first surveyors could not attain the accuracy that has since become possible, and an appeal made for rectification by the State of South Australia was set aside by the Privy Council, which pronounced in favour of the inaccurate line as having acquired the sanction of long usage. The Murray boundary was the subject of prolonged disputes. In 1840 a Land and Emigration Commission in London recommended that New South Wales be divided into three provinces with capitals at Moreton Bay, Sydney, and Melbourne, and proposed for the southern division a boundary (the Murrumbidgee River and a line from its source to Moruya) which would have severed from Sydney districts settled before Melbourne was born. The New South Wales Legislative Council protested successfully against this, and in 1841 persuaded Lord Stanley—then Secretary of State for the Colonies—to give them the Murray boundary; by way of accentuating their victory they obtained also the whole of the Murray River, so that the boundary ran along its southern bank instead of dividing its waters equally between the riparian colonies. Victoria never forgot the defeat, and has made several attempts to revive the old Murrumbidgee claim.

Geography.—Victorian history depends so much on its physical geography that the latter deserves first consideration. The backbone of the State is a prolongation westwards of the Australian 'main range,' which divides the valley of the Murray from three low-lying strips along the sea—Gippsland and its 'lakes' (really salt-water lagoons), the comparatively barren country surrounding Port Phillip, and the rich volcanic plains of the 'Western District.' In the western part of the State the backbone ceases to exist, and plains extend under various names—Mallee, Wimmera, Glenelg—from the Murray to the sea. Gippsland is divided from the Port Phillip district by a spur of the main range that runs southward to Wilson's Promontory; the Anakies and the You-Yangs, two small basaltic ridges, are the eastern boundary of the western district (also basaltic); to the south of it rises an isolated massif, the Otway Range, which carries heavy timber. The main range itself occupies the greater part of eastern Victoria; a prolongation of the Kosciusko tableland, the highest region in Australia, it includes Mount Bogong (6509 feet), Mount Feathertop (6306 feet), and six other peaks over 6000 feet, besides another half-dozen over 5000 feet; but west of the 147th meridian it loses both solidity and height, and narrows down to an unimpressive, easily traversable watershed whose principal points are Mount Macedon (3325) behind Melbourne and Mount Alexander (2430) above Castlemaine. Near Ararat it ends in a low north-south ridge, the Pyrenees, parallel to which and a little westward runs a higher ridge, the Grampians (Mount William, 3829). Names in Australia are often singularly misleading.

The coastal rivers of Victoria are unimportant. The Snowy River (265 miles), which drains the Kosciusko tableland, is too rapid and traverses too rugged a district to have any commercial value; a few small streams drain Gippsland into its lakes; the non-tidal Yarra (115) serves chiefly to give

Melbourne a water-supply; the Barwon goes seaward in shallows near the mouth of Port Phillip; and of the streams that nominally drain the western plains only the winding Glenelg (280) can be considered a permanent watercourse. The important Victorian rivers are tributaries of the Murray—the Mitta Mitta (125), Ovens (110), and Goulburn (280), which derive their steady flow from the well-watered eastern ranges; the Goulburn in particular maintains reservoirs from which not only its own lower valley but those also of two neighbouring streams—the Campaspe and Loddon—are thoroughly irrigated. West of the Loddon no stream reaches the Murray. The Avoca, Avon, and Wimmera rise in the uplands west of Ballarat, lose more than they gain as they flow northwards, and end in shallow lakes. The coastline is on the whole uninviting. The rough foothills that lie behind Cape Howe die down south-westwards into a 'ninety-mile beach' which was the first Australian land sighted by Captain Cook. Similar beaches extend along and past the Gippsland lakes towards the rugged area of Wilson's Promontory, and a harbourless shore-line runs thence north-west to the shallow entrances of Western Port. A rocky peninsula hems in the expanse of Port Phillip (see MELBOURNE); from its mouth westwards to near Warrnambool similar but more rugged country forms a coast-line devoid of harbours, whose local seaborne traffic is worked with piers running out from open beaches, and ceases in rough weather. Warrnambool, however, the centre of a rich dairying and potato-growing district, has an excellent though little-used artificial port, and smaller havens exist at Port Fairy and Portland. The mouth of the Glenelg is too encumbered with shallows for commercial use.

Geology.—Geologically the backbone of Victoria is a mass of Palæozoic rock through which granites obtrude themselves at Wilson's Promontory and Cape Howe, and on which lie here and there belts of Mesozoic and Tertiary strata. The most productive gold-reefs have been Lower Ordovician; the alluvial 'deep leads' in Gippsland occur in the Miocene, farther west in Pliocene strata. Proterozoic gneisses and schists are known at Casterton in the Glenelg district, Ordovician and Silurian rocks east of Melbourne and at Cape Liptrap; the coal-measures are of Lower Jurassic age, the lignite ('brown coal') beds are Miocene. Most of the Western District's volcanoes are post-Miocene, and their lavas, tuffs, and basalts overlie earlier Tertiary sediments; but the Otway peninsula south of them is Jurassic. Near Warrnambool a remarkable volcano, Tower Hill, is of recent origin, like its neighbour Mount Gambier in South Australia.

History.—From the sea Victoria is practically unapproachable except through the narrow entrance of Port Phillip; until that approach was systematically exploited there was little settlement south of the Murray, since the easy access overland was handicapped by the distance from Sydney and by one or two blundering attempts to use it. Nor was there at first any inducement to extend colonisation so far. In Phillip's time it was believed that the mainland extended to Hobart; Bass, the discoverer of the strait, was not attracted by the shore-line he had coasted, nor was James Grant, who roughly surveyed in 1800–1801 the shore-line from the Glenelg to Cape Otway, and from Cape Schanck to Cape Howe. In 1802 John Murray entered Port Phillip, hoisting the British flag there on 8th March; Flinders visited it six weeks later, and as a result of their reports the British Government in 1803 sent David Collins with a party of soldiers and convicts direct from England to colonise the new region. Collins unfortunately disembarked his party at Sorrento, just inside the Heads on barren soil, and after four months' experience abandoned Port Phillip for Hobart—a little bold exploration northwards might have brought him to the site of Melbourne, but he feared the enmity of the aborigines. For twenty years the region was unvisited. Then, in 1824 Hamilton Hume and William Hovell ventured across the rough foothill country west of the Kosciusko tableland in search of an overland route to Bass Strait, crossed several fine rivers (including the upper Murray, which they named the Hume), and reached the shores of Port Phillip near Geelong. They returned with glowing reports of the country, but had unfortunately miscalculated their terminal position, and believed they had reached Western Port; consequently, when Darling in 1826 sent an expedition to occupy that bay on the strength of their report, and found it altogether unsuitable for settlement, the value of the whole report was discounted and Port Phillip neglected for another ten years. Indeed, the first white permanent settlement made on Victorian shores was not at Port Phillip at all, but at Portland in the far west, where in 1834 Edward Henty formed a whaling station and began to farm the rich soil inland.

In 1835 John Batman, a prominent Tasmanian farmer, conducted an expedition across the strait into Port Phillip and explored its western shores up to the Yarra valley, where he 'bought' about 600,000 acres (including the site of Melbourne) from the aborigines. Before he could return to Launceston, John Pascoe Fawkner, a Launceston lawyer, innkeeper and journalist, despatched an expedition to Western Port; this destination proving as uninviting as ever, the expedition went off to Port Phillip, ran up its eastern side to the Yarra, and camped at the head of tidal waters in the area already pre-empted by Batman. There were quarrels, which Governor Bourke settled from Sydney by refusing to recognise any private purchases from natives, since the land was already part of the colony of New South Wales. Batman and his friends, interested chiefly in pasturage for stock, spread themselves westwards from Geelong through the western plains to the South Australian border; Fawkner's contingent settled in and near Melbourne, and set themselves to build a town, which Bourke in 1837 visited and named; he undervalued the Melbourne site, and gave it only the prime minister's name, reserving the king's for Williamstown at Yarra mouth, which is now a minor suburb.

In 1836 Thomas Mitchell, the Sydney surveyor-general, set himself to explore the lower Murray, and made his way across country thence to Portland, returning north-eastwards past Mount Alexander to Albury and opening up an easier overland route to Melbourne than that followed by Hume and Hovell. This initiated a migration from the Sydney side into northern Victoria, which soon found Melbourne its nearest outlet to the sea (Batman's followers remained faithful to Geelong), and so really established the Port Phillip district as a separate entity; and the last strip of fertile Victorian land was opened to settlement in 1841, when Angus McMillan found passable tracks from the Kosciusko tableland into Gippsland, and brought after him a string of squatters seeking new pastures.

From the first the Port Phillip settlers were difficult to manage. They had occupied the district, they felt, in spite of Sydney, and were not likely to receive just treatment from Sydney legislatures; although in 1843 they were given six members out of the 24 elected to the Council, they could not find six local men to represent them 600 miles away; they chose Sydney friends,

found that compromise unsatisfactory, and in 1848 solemnly elected Earl Grey, then Secretary of State for the Colonies, on the ground that an absentee was no worse than a Sydney man. Grey, who was at the moment trying to soothe the Australian colonies into accepting further supplies of convicts, did his best to oblige; he revived the Privy Council's Committee for Trade and Plantations (which had for a long time confined itself to trade affairs), and in 1849 accepted its recommendation that Port Phillip should be separated from the parent colony. An Act of 1850 embodied this and other proposals of the Committee, and in 1851 Victoria came into being. At the moment its population was just over 77,000—an increase of nearly 600 per cent. in ten years. Three years later it was 232,000, and three years after that 411,000.

In April 1851 Hargraves announced the discovery of payable gold in New South Wales. Promptly a Melbourne committee offered a reward for a similar discovery in Victoria, and by August gold had been found at half-a-dozen places on the watershed north-west of Port Phillip, notably at Ballarat. By December the fields at Mount Alexander and Bendigo had been opened up, and gold was being carted to Melbourne at the rate of two tons a week. Next year new fields were opened in the Mitta Mitta and Ovens valleys. Immigration became enormous; but men began to discover that money could be more surely made by attending to the wants of the diggers than by joining them, and the social structure, which had been almost disintegrated, regained its coherence. Attempting to tax the diggers unfairly, the local legislature roused them into rioting; this culminated in October 1854 at what is usually called the 'Eureka Stockade,' where a 'Reform League' composed chiefly of Irishmen and foreigners from the Californian goldfields raised the flag of an independent republic. Of actual fighting there was little—about 300 British troops stormed a stockade held by about 200 rebels—but, though the diggers' grievances were entirely the result of local legislative action (the governor had vainly urged the Council to make concessions), the Stockade became in popular legend a praiseworthy demonstration on behalf of Australian liberty against British tyranny. It is for that reason that the true story is worth mention here.

The later history of Victoria is quickly told. Enriched from immensely productive goldfields, Melbourne became the centre of Australian enterprise, financing the exploitation of Queensland pastures and the exploration of the central wastes as well as the erection and management of numerous factories—for which immigrant European townsfolk, attracted by the gold-rush and soon disappointed by their lack of success, furnished skilled labour. Melbourne also began to consider itself the true capital city of Australia, and its attempts to oust Sydney from that position (which Sydney claimed by primogeniture) aroused a rivalry that wrought much damage when federation became imminent. The squatters' areas—Gippsland and the Western District—were little affected by the gold-rush, and maintained their peaceful seclusion until the end of the century; but the great plains of the Murray valley, from the Albury-Seymour line westwards, were slowly peopled with farmers, and before 1900 irrigation had extended even into the far west of the Mallee, and had founded Mildura. The farming population has occasionally made itself felt as a political force, when disgusted with what it considers the extravagance or the purely urban predilections of the central government; but for the most part urban—that is to say, Melbourne—interests have guided Victorian affairs, notably by maintaining (until the Commonwealth came into being) a policy of high protection to foster manufactures. Up to 1900 this policy was Victoria's distinguishing mark; since then, all Australia having come under a protectionist régime, other States have multiplied their factories, and New South Wales now manufactures 160 million pounds' worth a year against Victoria's 118. Since the advent of Federation Victoria has profited by having the seat of government within its territory, but this arrangement has come to an end with the transference (in 1927) of the Federal Parliament to Canberra.

Industries.—Victoria, being the smallest and for a long time the richest of the Australian mainland colonies, has been more thoroughly exploited than its fellows; 60 per cent. of its area is owned privately, whereas in New South Wales the proportion is about a fifth (in Tasmania it is about a third). The area—less than a quarter—which the Crown has neither sold nor leased consists chiefly of tangled ridges and untillable valleys in the eastern part of the main range. Cattle are pastured all over the State except in the Mallee, but mainly in Gippsland; dairy cattle also occupy many centres of the Western District, especially round Warrnambool. Sheep are comparatively rare outside the Western District, so that in the years before Federation it was cheaper in many areas to live on poultry than on mutton. Their number (about 12 million) has not greatly altered since 1880. Agriculture, on the other hand, has increased rapidly both as to area occupied and as to yield per acre. In 1880 about 10 million bushels of wheat were produced in the eastern part of the Murray valley; by 1925 the whole valley between Albury and the western border was covered with wheatfields, the lower Goulburn valley and the southern Wimmera (Horsham, Warracknabeal, Birchip) being especially prolific. In 1924–25 $2\frac{3}{4}$ million acres yielded over 47 million bushels. Oats are also an important crop on the upper waters of the Murray tributaries, and potatoes along the south coast, especially near Warrnambool; orchards flourish near Port Phillip—because Melbourne is the great fruit market—and vineyards on the Murray (table-grapes at Mildura, wine-grapes round Rutherglen) and on the upper Yarra. In the early years of this century phylloxera almost ruined the wine industry, but the use of resistant stocks has restored its prosperity. Victoria includes now a third of the grape-growing area in the Commonwealth, and produces a good deal more than half the Australian raisin crop, but little more than a tenth of the wine. Originally the eastern half of the State was covered with forest, the Western District and the Wimmera being comparatively treeless, and the Mallee country in the far north-west covered with the dwarf eucalypt scrub from which it took its name. Nowadays the forest area covers the main range east of Melbourne and the rugged areas of the Otway and Wilson's Promontory. Stringybark (*Eucalyptus amygdalina*) and messmate (*E. obliqua*) are the principal hill-timbers, and red gum (*E. rostrata*) is plentiful along the Murray; the mountain-ash of western Gippsland (*E. regnans*) affords specimens that are only excelled in height by the Californian sequoias, though their height (which does not exceed 325 feet) is often patriotically exaggerated.

Gold was for half a century the chief Victorian mineral, but the yield has of late years decreased considerably. Between 1851 and 1925 the value of the gold-yield was estimated at over 300 million pounds, but the 1925 yield barely reached £200,000. Black coal nowadays is at least three times as valuable, and the deposits of brown coal, though not largely mined for sale, are becoming of great

importance since it was decided to use those at Morwell in Gippsland for the production of electric power. These Morwell deposits extend over 50 sq. m. of country, and contain at least 30,000 million tons of lignite, which are being excavated in open cut and delivered to the power-station close by (now named Yallourn) at the rate of 3500 tons a day. In 1925 over 20,000 consumers in Melbourne received from this source over 58 million kilowatt hours of electric power. Briquettes are also manufactured at Yallourn (about 100,000 tons a year), but the Melbourne populace is slow to appreciate their value. Small quantities of tin and antimony are Victoria's only other marketable minerals.

Victoria's chief asset is her factory-system. In 1848 the Port Phillip district contained 41 of the 479 industrial establishments then in Australia; in 1901 Victoria had 3249 (29 per cent. of the Australian total), and in 1925 7425 (nearly 36 per cent.). This specialisation in manufactures—carried on, as a rule, close to the State's chief seaport—largely accounts for the over-concentration of population in the metropolis. More than 54 per cent. of Victorians reside in the metropolitan area, the three principal outside towns (Ballarat, Bendigo, and Geelong) having barely 5 per cent. between them. Consequently the State Government is controlled by city influences to a greater extent than anywhere else in Australia, and the State's Labour party is wholly of the town artisan type; in other States the country-folk have far more share in both government and party.

Government, &c.—The State Government is of the usual Australian type—a Governor appointed by the Crown, a two-chambered legislature (council of 34 members elected by voters with a small property or educational qualification; assembly of 65 elected by preferential voting under adult franchise); ministry of eight, administering 18 departments, with an indefinite number of colleagues without portfolio. In the Federal Parliament Victoria is represented by six senators and 20 members of the house of representatives. The public revenue for 1924–25 was £24,304,887, the public expenditure £23,170,483, and the public debt on 30th June 1925 £131,169,565. This latter has of late years been increasing at the rate of between eight and nine million pounds a year; 46 per cent. of the money borrowed has been spent on railway construction, 13 per cent. on waterworks, 21 per cent. on forwarding land-settlement. Of the revenue and expenditure half is concerned with the State railways, whose incomings for 1924–25 amounted to 12⅝ millions, and their outgoings to 12½ millions. These railways include 4362 miles of 5 ft. 3 in. gauge and 122 of 2 ft. 6 in. gauge, all owned by the State, as well as 58 miles privately owned; they serve very thoroughly the whole centre and west, but the eastern area is merely skirted by lines to southern Gippsland and along the upper Murray. Connection with the South Australian lines is made at Serviceton on the main western line, Pinaroo in the Mallee, and near Mount Gambier in the south; with the New South Wales lines at Albury on the main line to Sydney and Tocumwal lower down the Murray; at Echuca a line on the Victorian gauge enters New South Wales and exploits a large area of the Riverina, and similar lines for a similar purpose have been authorised to cross the Murray near Kerang and Mildura. This admission of the railways of one State to the territory of another is unique in Australia.

On the 31st of March 1926 the State's population was estimated at 1,691,486, of whom 912,130 lived within the metropolitan boundaries. About 4 per 1000 of the number belonged to non-European races (mainly the Chinese), and less than 1 per cent. to races of the European continent. The remains of the aboriginal population numbered 66. As has already been hinted, the white population is very unequally distributed over the territory. For purposes of local government the State is divided into 53 municipalities (cities, towns, or boroughs, according to size) and 139 shires; Melbourne and its suburbs account for 912,130 inhabitants; Ballarat, Geelong, and Bendigo for 113,790; the rest of the municipalities for 5750, and the shires for 635,340. This disproportion has increased since 1921, when 50 per cent. of the population was metropolitan against 54 in 1925. About 45 per cent. of the whole number are classed as breadwinners.

Education is controlled by the State more thoroughly than in other parts of Australia; at the same time private schools are given a more definite place in the general scheme, and are admitted to a share of public endowments by way of scholarships. Primary education is compulsory between the ages of 6 and 14; over 80 per cent. of the children attend the 2700 State schools; the rest are served by private schools, which must be registered (as 'primary' or 'sub-primary') under a branch of the Department of Education and are supervised by it in respect of their staffs and buildings. Secondary schools are similarly either carried on or supervised by the State, which provides scholarships tenable at schools of a certain standard, whatever the management. The State also provides technical schools, agricultural high schools, and schools of domestic arts. The University of Melbourne, inaugurated in 1855, has a staff of 24 professors and 134 lecturers and demonstrators, serving over 2000 students; attached to it is a Conservatorium of Music with 46 teachers and 226 students. Its revenues include about £74,000 from fees, £64,000 from public funds, and £10,000 from private benefactions.

Among other institutions of educational value are the Public Library, Museums, and National Art Gallery of Victoria, comprised in a single city block at Melbourne and managed by a single board of trustees. The gallery has an income of about £23,000 a year from the Felton bequest alone, and is therefore able to buy largely in European art markets. The library, founded in 1853, possessess a magnificent reading-room (114 ft. in diameter, 114 ft. high) on the lines of that in the British Museum, but far better lighted. The Museum is particularly rich in Australian ethnological collections. The Royal Society of Victoria, founded in 1854 as 'The Philosophical Society,' was in 1860 responsible for despatching the Burke and Wills expedition to explore central Australia.

Trade, &c.—In 1925–26 the oversea trade of Victoria—conducted almost entirely through the port of Melbourne—was valued at over 83 millions sterling, about 29 per cent. of the total Australian oversea trade. The imports were over 50 millions (33 per cent.) and the exports nearly 33 millions (22 per cent.). The produce of the State was valued in 1924–25 at about 102 millions—over £61 per inhabitant—to which primary industries contributed over £56,000,000, and manufacturing industries £45,000,000; this latter figure, however, represents merely the 'added value' given by the process of manufacturing, the total value of the factory output reaching 118 millions.

BIBLIOGRAPHY.—See AUSTRALIA and MELBOURNE and books there cited; also articles in *The Australian Encyclopædia* on Exploration by Land, Exploration by Sea, Geography, Geology, Melbourne, and Victoria. Bonwick's *Port Phillip Settlement* (1883), and Labilliere's *Early History of the Colony of Victoria* (1879) are still useful, especially if supplemented by the numerous and well-documented articles of the *Victorian Historical Magazine*. For the general history of the colony see Turner's *History of the Colony of Victoria* (1904), which

is on the whole trustworthy in spite of its obvious bias. For their special subjects Sweetman, Long, and Smyth's *History of State Education in Victoria* (1922) and the official *Forests and Forestry in Victoria* (1925) may be consulted.

Victoria. See HONG-KONG; also CAMEROONS.

Victoria, the capital of British Columbia, Canada, is beautifully situated at the SE. extremity of Vancouver Island, on the Straits of Juan de Fuca. The site was originally that of the Hudson's Bay Company's Fort Albert in 1843. The city, incorporated in 1862, has some fine public buildings and an Episcopal cathedral, the foundation stone of which was laid in 1926. There is a splendid harbour, which does a large shipping trade with the Orient, &c., while the commerce in lumber, coal, fish, is very important, and the surrounding country is rich in fruit, timber, and minerals. The 'Torquay of Canada,' with its mild and equable climate, attracts large numbers of tourists every year. Pop. (1881) 5925; (1921) 38,727.

Victoria, (1) a seaport of Brazil, about 270 miles NE. of Rio de Janeiro, capital of the state of Espirito Santo, on an island in Espirito Santo Bay, which admits ships drawing 14 feet. Founded in 1535, Victoria received its present name some 20 years later, on account of a victory gained by the Portuguese over the native inhabitants. The port has a large trade in copper and coffee. There is rail connection with the capital and São Paulo. Pop. 20,000.

Victoria, LAKE, a great fresh-water lake in East Central Africa, situated on the equator, and on the meridian of 33° E., has an area of about 26,000 sq. m., or nearly the size of Scotland. It lies about 3720 feet above sea-level. The geological evidence points to the origin of its basin at a very remote period, a number of terrace-like faults along the western shores suggesting a probable cause of the formation of the hollow which now contains the lake. The traces of volcanic action do not seem sufficient to account for so large a depression. The prevailing rocks are gneiss and schists, with porphyritic granite at the south extremity, and some lava and ironstone towards the north. The igneous area is, upon the whole, barren and desolate looking, the remainder of the basin being clothed with luxurious tropical flora, exceedingly varied in character. This variety is, perhaps, most strikingly exhibited on some of the islands. The fauna is also varied, the number of alligators frequenting the waters being very large. Hippopotami, although less frequently met with, are exceedingly fierce, and are held in great dread by the native boatmen. The water is good and fresh, although somewhat insipid to the taste, and frequently assumes a dirty white colour. The lake is drained by the Nile, and its chief feeders are the Kagera, the Nzoia, the Ruizi, and the Katonga. As these are all comparatively insignificant streams, and the evaporation from such a large body of water in an equatorial climate must be very great, it is supposed that the lake draws the larger part of its supply from springs in its bed. Seiches have been noticed along the shores, the rise lasting from about half an hour to an hour in time; from such observations as have been made, the winds do not appear to exercise much influence upon this curious phenomenon. The natives assert that a periodical rise and fall in the level of the lake takes place at intervals of about twenty-five years, and water-markings along the coast point this way. The railway from Mombasa reaches the north-east corner of the lake at Kisumu. Cyclonic storms, accompanied by thunder and lightning are common, and occur most frequently in the month of August. Fishing is mostly carried on by the use of the rod and line, except in Lower Kavirondo and among the Ba-Sesse people, where grass mats and basket traps are used as nets. The lake, whose native name is Ukerewe, was discovered by Speke in 1858, visited by him and Grant in 1861–62, and subsequently partly explored by Stanley (1875), Mackay, Thomson, and others.

Victoria, Queen of the United Kingdom of Great Britain and Ireland and Empress of India, only child of Edward, Duke of Kent (fourth son of George III.), was born at Kensington Palace, 24th May 1819. Her mother, Victoria Maria Louisa (1786–1861), was the daughter of Francis, Duke of Saxe-Coburg, and sister of Leopold, king of the Belgians. Her first husband, the Prince of Leiningen, died in 1814; and in 1818 she married the Duke of Kent. The duke died in 1820, leaving his widow in charge of an infant daughter only eight months old, who had been baptised with the names of Alexandrina Victoria. By-and-by the Duchess of Northumberland was associated with the Duchess of Kent in the education of the young princess. The princess's father having belonged to the Whigs, her political education was naturally derived from the members of that party; and Viscount Melbourne (q.v.) thoroughly instructed her in the principles of the British constitution. She ascended the throne of the United Kingdom on the death of her uncle, William IV. (q.v.), 20th June 1837; her uncle, the Duke of Cumberland, became king of Hanover, in virtue of the law which excluded females from that throne, and so the long connection between the crowns of England and Hanover was terminated. Victoria was crowned at Westminster, 28th June 1838. She found on her accession Viscount Melbourne at the head of the government; and on a change of administration (1839) she refused to change, in accordance with precedent, the ladies of the bed-chamber, the result being that Peel resigned and Melbourne's administration was prolonged till 1841. The young queen was married at St James's Palace (10th February 1840) to Prince Albert (q.v.), Prince of Saxe-Coburg and Gotha, and second son of the then reigning duke.

The chief events of this long reign may be traced in the articles (with the books there cited) on England, Great Britain, Ireland, the several colonies and dominions, India, and the successive premiers, on the Corn Laws, Post-office, Reform, Jews, Army, Education, Volunteers, Crimean War, Abyssinia, Afghanistan, Zulus, Egypt, Transvaal. In 1876 'Empress of India' was added to the royal titles of the Queen. The death of the Prince-Consort in 1861 led his widow to live mainly in seclusion for several years, but, though she never afterwards took so prominent a part in public life, she never neglected any of her essential duties as queen. Other severe trials were the deaths of the Princess Alice (of Hesse), of the Duke of Albany, of the Duke of Clarence (elder son of Edward, Prince of Wales), and of the Duke of Edinburgh. She herself died at Osborne House, 22d Jan. 1901, and was buried in Frogmore Mausoleum beside her beloved consort. Her jubilee (1887) and 'diamond jubilee' (1897) emphasised the loyalty of the colonies to the mother country. Her *Letters* illustrate her shrewdness, sagacity, self-devotion and persistence, her high idea of the importance of her office, and her determination to bring its influence to bear both on home administration and the administration of foreign affairs. Her sympathy with Germany (as in the Sleswick-Holstein controversy) and her dislike to the Italian national *risorgimento* against Austria had to be taken account of by her ministers; as also her favour for some statesmen (Melbourne and Beaconsfield), her strong distrust of others (Palmerston and

Gladstone). 'The Queen,' said Lord Esher, 'never seemed to doubt that the country was *hers*, that the ministers were her ministers, and that the people were *her* people. Ministers and parliaments existed to assist *her* to govern. She was the ruler of her kingdom, and the crown was, in her eyes, not the coping-stone of the fabric, but the foundation upon which the fabric rested.'

Queen Victoria had four sons and five daughters: the Princess Royal, Victoria (1840–1901), married 1858 to Frederick-William, afterwards German Emperor (see FREDERICK III.); Albert-Edward, Prince of Wales (1841–1910; see EDWARD VII.); Alice (1843–78), married 1862 to the Grand Duke of Hesse; Alfred (1844–1900), created Duke of Edinburgh 1866, married 1874 the Russian Princess Marie, became Duke of Saxe-Coburg-Gotha in 1893; Helena (1846–1923), married 1866 to Prince Christian of Denmark; Louise, born 1848, married 1871 to the Marquis of Lorne (in 1900–14 Duke of Argyll); Arthur, born 1850, created Duke of Connaught 1874, married 1879 Princess Louise Marguerite of Prussia; Leopold (1853–84), created Duke of Albany 1881, married Princess Helena of Waldeck 1882; Beatrice, born 1857, married 1885 to Prince Henry of Battenberg (1858–96). The premiers of the reign were:

1835. Lord Melbourne.	1868. Mr Disraeli.
1841. Sir Robert Peel.	1868. Mr Gladstone.
1846. Lord John Russell.	1874. Earl of Beaconsfield.
1852. Earl of Derby.	1880. Mr Gladstone.
1852. Earl of Aberdeen.	1885. Marquis of Salisbury.
1855. Lord Palmerston.	1886. Mr Gladstone.
1858. Earl of Derby.	1886. Marquis of Salisbury.
1859. Lord Palmerston.	1892. Mr Gladstone.
1865. Earl Russell.	1894. Earl of Rosebery.
1866. Earl of Derby.	1895. Marquis of Salisbury.

See *Early Days of the Prince-Consort* (1867, by General Grey); *Leaves from the Journal of our Life in the Highlands* (1869, edited by Sir A. Helps); *More Leaves* (1884); *The Life of the Prince-Consort* (1873–80, edited by Sir Theodore Martin); McCarthy's *History of our Own Times* (1879–97); T. H. Ward's *Reign of Victoria* (1887); with Lives of the Queen by R. R. Holmes (1897; new ed. 1901), the Marquis of Lorne (1901), Sir Sidney Lee (1902), Mrs Crawford (1903), Sir T. Martin (1908), Lytton Strachey (1921), as well as that published by the *Times* (1901); also *The Girlhood of Queen Victoria*, ed. from her diaries by Viscount Esher (1912); *Letters, 1837–61*, ed. Benson and Esher (1907); and *Letters, 1862–78*, ed. Buckle (1926).

Victoria, a genus of plants of the family Nymphæaceæ, resembling the common water-lily, but most nearly allied to the genus Euryale, and distinguished from it particularly by the deciduous

Fig. 1.—Victoria regis.

tips of the calyx, and the sterility of the innermost stamens. Of the two species known, one is *V. regia*. Seen by Hänke about 1801, by Bonpland, D'Orbigny, and others, it was first described in 1832 by Pöppig, who observed it in the river Amazon; and it was found by Schomburgk and others in many rivers of the north-east of South America. Its leaves are peltate, circular in outline, float upon the water, and attain a diameter of 5 to 6 feet; have the margin turned up all round about 2 inches high; are of a purplish colour on the under side, and there exhibit a sort of wicker-work of very prominent veins, furnished with prickles. The flowers rise amongst the leaves upon prickly stalks. They are more than a foot in diameter, white, internally rose-coloured, and are very fragrant. The fruit is a capsule, almost globose, with a depression on the top about half the size of a man's head, fleshy within, and divided into numerous cells, full of round farinaceous seeds, which are an agreeable article of food. The plant is therefore called *Maïs del Agua*, or Water Maize, in some parts of South America. To the cultivation of this plant special hothouses have been devoted at Kew, Chatsworth, Crystal Palace, and other places in Britain, and elsewhere in Europe, and it was successfully cultivated and flowered in a heated tank in the open air in a nursery at Chelsea in 1851 and a few years subsequently. It has been introduced into India from seeds produced in England.

Fig. 2.—Flower of *Victoria regia*.

Victoria and Albert Museum. See KENSINGTON, p. 422.

Victoria Bridge. See BRIDGE, p. 447.

Victoria Cross, a decoration instituted at the end of the Crimean war in 1856, and conferred on members of the British navy, army, and air-force, also since 1920 on members of the nursing staff of either sex, who have performed, in presence of the enemy, some signal act of valour or devotion to their country. Non-military persons who have served as volunteers against an enemy are also eligible. The Victoria Cross is in the form of a Maltese cross, and is made of bronze. In the centre is the royal crown, surmounted by the lion, and below, on a scroll, the words 'For Valour.' The ribbon, till 1918 red for the army and blue for the navy, is now red for all services. On the clasp are two branches of laurel, and from it the cross hangs, supported by the initial 'V.' An additional act of exceptional bravery may be marked by a bar on the ribbon. The decoration is accompanied, in the case of non-commissioned officers and men, by a pension of £10 a year, and £5 is added for each bar. The general distribution of the crosses earned in the Crimean war (to 62 personally) took place in 1857, while during the Great War 633 crosses and 2 bars were awarded. See works by R. W. O'Byrne (1880), W. Richards (1891), Creagh and Humphris (1924).

Victoria Falls. See ZAMBEZI.

Victoria Land. See ANTARCTICA, POLAR EXPLORATION.

Victorian Order, Royal. See ORDERS OF KNIGHTHOOD.

Victoria University. See MANCHESTER. Leeds (q.v.) and Liverpool (q.v.) universities were also at first constituent colleges.

Victualling-bill, or BILL OF VICTUALLING, is a list of necessary stores shipped from the bonded warehouse, or for drawback on board vessels proceeding on oversea voyages. It is made out by the master and countersigned by the collector of customs, the object being to prevent frauds on the

revenue. The stores vary with the number of the crew and passengers and the duration of the voyage. In the case of ships sailing in ballast, the bill of victualling acts as the certificate of clearance. See Customs Consolidation Act, 1876, sects. 126–133.

Vicuña (*Auchenia vicugna*), a species or variety of the South American genus Auchenia (allied to the camels), which also includes the llama, alpaca,

Vicuña (*Auchenia vicugna*).

and the guanaco. Unlike the first two, but like the last, the vicuña lives wild. It is somewhat smaller than a European red deer; its wool is light brown with some white beneath. It frequents the most desolate parts of the Cordillera, at great elevations, and delights in a kind of grass, the Ychu (*Stipa Jarava*), which abounds there in moist places. The small herds commonly include from six to fifteen females with one male. When the females are quietly grazing, the male stands apart, and carefully keeps guard, giving notice of danger by a kind of whistling sound, and a quick movement of foot. When the herd takes to flight, the male is said to cover their retreat, often pausing to observe the motions of the enemy. The vicuña is a very active animal, like the chamois or the antelope. The Indians seldom kill it with firearms, but set up a circle of stakes, about a mile in circumference, into which the vicuñas are driven. The soft wool is much valued for weaving. In 1920 the Peruvian government placed a control over the manufacture and sale of skins and of articles made of vicuña wool.

Vida, Marco Girolamo, a 16th century Latinist and critic, was born at Cremona between 1480 and 1490, studied theology, was favoured by Leo X., who gave him a priory, and by Clement VII. was made Bishop of Alba, where he died 27th September 1566. He was at the Council of Trent, and was a friend of Cardinal Pole. Vida wrote Latin orations and dialogues, but is known mainly as a poet, remarkable for the grace of his Latin style rather than for his force of thought; his chief poems being *Christias* (1535) and *De Arte Poetica* (1527), others being on the silkworm and on the game of chess (trans. Lambert, 1921). There is a monograph by Lancetti (1840); and see Symonds, *The Renaissance in Italy*, and Saintsbury's *History of Criticism*.

Vidin, a Bulgarian fortified town on the Danube, 130 miles E of Belgrade, with distilleries, manufactures of gold and silver filigree, and an active river commerce. It occupies the site of the Roman town Bononia. Pop. 17,500.

Vidocq, Eugène François, 'the detective,' was born a baker's son at Arras on 23d July 1775, and as a boy persistently robbed the till of his father's shop. He was sent to the house of correction, but signalised his release by decamping with £80. Of this a sharper relieved him at Ostend; and to keep himself in life he engaged himself to sweep the cages of a travelling menagerie. From this post he was advanced to that of tumbler and acrobat; and a further promotion was intended him to a supposed savage, eating raw flesh and drinking blood. As he chose to decline the appointment, his services were dispensed with, and he returned home. Entering the army, he attained the rank of corporal, and served with some credit in Belgium and elsewhere, till a wound disabled him. For some years he seems to have lived as a scoundrel at large, occupying himself in swindling and disreputable love-affairs. In 1796 he turned up in Paris, and being detected in forgery was sentenced to eight years as a galley-slave. Before his term of durance had expired he found means to escape, and became one of a band of highwaymen. They, on discovering that he was an escaped galley-slave, declined, it is said, any further acquaintance, whilst exacting from him a solemn oath not to betray them. Vidocq took the oath, and instantly delivered the whole gang into the hands of the authorities. Then repairing to Paris about 1808, he offered his services to the authorities there as a spy on the criminal classes. His advances were at first coolly received, but gradually he made his way; and in 1812 a 'Brigade de Sûreté' was organised, with Vidocq as chief. Consisting at first of only four men, by degrees it was enlarged to twenty-eight; and its efficiency was something marvellous. Suspicions, however, grew rife that Vidocq was himself the originator of many of the burglaries he showed himself so clever in hunting out, and in 1825 he was superseded. He then started a paper-mill, and in 1832 a private detective office, which soon, however, was closed by the authorities. He died in Paris, May 1857. His *Mémoires* (1828), even if really by himself, are certainly untrustworthy.

Viebig, Clara, German novelist, was born at Trier in 1860, was educated at Düsseldorf, and studied music for a time at Berlin. Many of her works—which include *Rheinlandstöchter* (1897), *Das Weiberdorf* (1900), *Das Tägliche Brot* (1900), *Wacht am Rhein* (1900), *Absolvo te* (1907), *Vor den Toren* (1910), *Die Töchter der Hekuba* (1917)—are partly autobiographical; some are nationalist in sympathy, and others deal particularly with Berlin, while most of them are strongly influenced by the naturalism of Zola.

Viélé-Griffin, Francis, French symbolist poet, was born in 1864 at Norfolk, Virginia, and has written harmonious and meditative poetry (*La Clarté de vie*), narrative poems (*Wieland le forgeron*), dramatic works (*Phocas le jardinier*) and *vers libre* (*In Memoriam*), all tinged with a suave melancholy.

Vienna (Ger. *Wien*), the capital of Austria, till 1918 of the Austrian Empire, is situated within Lower Austria, on the right bank of the Danube, and is intersected by the Danube Canal, a south branch of the Danube. The small river Wien flows through part of the town to join the canal. Vienna proper consists of the Inner City (*Innere Stadt*) and twenty-one districts (*Bezirke*) surrounding it, and, with a total area of some 165 sq. miles, is the largest city in Europe after London and Berlin. Formerly the city only comprised ten districts, enclosed by fortifications known as the Lines (*Linie*), replaced by the boulevard Gürtelstrasse in 1892, when the suburbs outside were incorporated. Pop. of this enlarged area (1857) 587,235; (1880) 1,090,119; (1900) 1,662,269; (1910) 2,030,850; (1923) 1,865,780. The irregular hexagon formed by the Inner City was until 1858 enclosed by an inner line of forti-

fications, the site of which is now occupied by the Ringstrasse, a series of handsome boulevards 55 yards wide, which bounds five of its sides. The sixth side is bounded by the Franz-Josef's Quay, on the Danube Canal. Though Vienna contains buildings of the 14th century, it is essentially a modern city; most of the conspicuous public buildings are later than the middle of the 19th century. The Inner City and the Ringstrasse are the most handsome and fashionable quarters. In the former are the cathedral of St Stephen, a fine Gothic building (late 13th to early 16th century), with rich sculptures and monuments, carved stalls and choir; the Maria-Stiegen (14th century) and Capuchin (1639) churches; the Hofburg, former imperial palace, a large and irregular pile of various dates, with a magnificent treasury, including the crown of Charlemagne, and a valuable library; and many palaces of the old nobility. On one side or other of the Ringstrasse rise the Bourse; the University (1874–84), which, founded in 1365 and renowned throughout the world as a medical school, has a teaching staff of over 800 and about 11,500 students, and has a fine library; the Hofburg Theatre and Supreme Law Courts, both in Renaissance style; the Gothic Rathaus (1873–83), with an important municipal museum; the splendid Houses of Parliament; the Museums of Natural History and of Art (1872–86), both with superb collections, the latter containing unrivalled examples of the Venetian and Netherland schools, Rubens, Brueghel, &c.; the sumptuous Opera-house; and the Austrian Museum of Art and Industry. The Church of St Charles Borromeo (1737), one of the many Baroque buildings, and the Votive Church (1856–79) in modern Gothic style are notable, while there are many splendid private picture-galleries, especially the Liechtenstein and the Albertina, the latter containing about a quarter of a million engravings of Dürer, Rembrandt, &c. The Public Hospital is one of the largest hospitals in Europe. There are many fine monuments and statues scattered throughout the city. In educational, scientific, artistic, and benevolent institutions of all kinds Vienna is very rich. There are many public parks, some bordering the Ringstrasse, but the largest is the Prater (nearly 7 sq. m.), one of the finest parks in Europe, opened in 1766. Schönbrunn, the former imperial summer palace, is about 3 miles from the Hofburg. The surroundings of Vienna, mostly thickly wooded hills (the Wienerwald), are very beautiful.

Vienna is still important financially, commercially, and industrially, and is the natural centre for the great Central European railway net. Scientific and medical instruments, excellent leather goods (bags, cases, pocket-books, shoes, &c.), trinkets, and articles de luxe, various manufactures of paper and of glass, household utensils, meerschaum pipes are all produced in Vienna; while in the matter of ladies' clothes she is second only to Paris. There is a large transit trade in textiles, grain, wines, &c., and after the Great War she became the natural *entrepôt* for the commerce of the Succession States. Over 2½ million pounds were spent in 1868–81 in regulating the channel of the Danube so as to render the river navigable at all times. The city of Vienna forms one of the provinces of the Austrian republic, and is governed by a city council (*Gemeinderat*) with a president and two vice-presidents, and a senate (*Stadtsenat*) with a burgomaster and two vice-burgomasters. At the same time it serves as capital for Lower Austria. The Viennese, mostly Roman Catholics, are vivacious, good-tempered, and pleasure-loving, fond of music, dancing, and the theatre.

Vienna occupies the site of the Roman *Vindobona*, which was established in 14 A.D. as the successor of the Celtic settlement of *Vindomina*. The Emperor Marcus Aurelius died here in 180 A.D. Later it became the capital of the 'Ostmark,' founded by Charlemagne. The beginning of its present importance, however, dates only from the period of the Crusades, which directed a steady stream of traffic through it. In 1276 it became the capital of the Hapsburg dynasty (see AUSTRIA, *History*), which became the most powerful in the world with the accession of Maximilian I. in 1493. Vienna was twice besieged by the Turks—in 1529, when it was defended by Count von Salm, and in 1683, when it was relieved by John Sobieski of Poland. Since the 18th century Vienna has reached the highest position in culture and musical importance. Napoleon twice occupied the city (1805, 1809), and there were violent disturbances in 1848, 1918, and 1927. The period after the Great War was one of difficulty, as in some respects Vienna is too large a capital for the restricted territory of the Austrian republic. The currency fell, but was stabilised in 1922, while Jewish enterprise and capital gradually created a new Vienna that is become once again the financial, commercial, intellectual, and artistic centre of SE. Europe (though anti-Semitism is very rampant).

Treaties have been concluded at Vienna in 1738, between the Emperor Charles VI. and the Infanta of Spain as to the kingdom of the Two Sicilies; in 1809, between Napoleon and the Austrians, after the defeat of the latter at Wagram; in 1864, settling affairs after the war of Prussia and Austria against Denmark; and in 1866, between Francis Joseph of Austria and Victor Emmanuel of Italy. The great Congress of Vienna (20th September 1814 to 10th June 1815) met to regulate the affairs of Europe after the overthrow of the Napoleonic Empire, and restore the 'balance of power.' Alexander I. and Nesselrode were there in the interests of Russia; the King of Prussia was supported by Hardenberg; Castlereagh, and afterwards Wellington, represented Britain; Metternich was Austrian plenipotentiary; Talleyrand secured a hearing for France; Spain, Portugal, Sweden, Denmark, Rome, and the minor German states were also represented. The chief final outcome was that Austria obtained Lombardy, Venetia, Illyria, Dalmatia, Tirol, Vorarlberg, Salzburg, and East Galicia; Prussia the province of Saxony, Posen, Swedish Pomerania, Westphalia, and the Rhenish Province; Hanover, extended in area and made a kingdom, fell to the Hanoverian dynasty in Britain; Britain secured Malta, Heligoland, Cape Colony, and Mauritius, and the protectorate of the Ionian Islands; Belgium and Holland were united as the Kingdom of the Netherlands; Norway was confirmed to Sweden; the Duchy of Warsaw was made over to Russia, and the republic of Cracow was constituted; the neutrality of Switzerland was guaranteed, and Neuchâtel (under Prussian sovereignty) added to the confederation; the German confederation was constituted with numerous internal rearrangements; and the former ruling houses were reinstated in Naples, Sardinia (to which Genoa was annexed), Tuscany, and Modena, Parma being given to the ex-Empress Maria Louisa; the papal see recovered nearly all its possessions; and France was restricted to very nearly the territory it possessed before the Revolution. The signing of the treaty (9th June) was hastened by the news of Napoleon's return from Elba.

See AUSTRIA and the books there cited; also works by Bermann (2d ed. 1903, in Ger.), Levetus (1904, in Eng.); *Geschichte* (1897–1900) and *Hofmuseen und Hofbibliothek* (1920) by Zimmermann; Schwerdfeger, *Vienna Gloriosa* (1923). For the Congress, see works by Flassan (1829), Angeberg (1864), and Webster (1919); also the histories of the various countries concerned.

Vienne, a dept. in the west of France, constituted mainly out of the old province of Poitou, lies between Indre and Deux-Sèvres; area, 2711 sq. m.; pop. (1881) 340,295; (1921) 306,248; (1926) 310,474. The Vienne, an affluent of the Loire, is the principal river, and has the Creuse as its chief tributary. The surface is mostly flat, with a gradual slope toward the north. The country consists almost wholly of fertile plains, fine pasture-lands, and extensive forests. Dairy-farming is important, and there are some minerals. The dept. is divided into the five arrondissements of Poitiers, Châtellerault, Civray, Loudun, Montmorillon. Poitiers is capital.

Vienne, one of the most ancient towns of France, in the dept. of Isère (far away from the dept. of Vienne), on the left bank of the Rhone, 19 miles S. of Lyons by rail. The river Gère passes through the town, and here joins the Rhone, after having supplied motive-power to a number of mills and factories. Vienne was the chief town of the Allobroges, is mentioned by Cæsar, and by Martial, who terms it *opulenta Vienna*; later, it became the capital of the kingdom of Burgundy and of the kingdom of Arles. In 1311–12 a council was held here, in which Pope Clement V. pronounced the suppression of the order of the Templars. Besides numerous water-conduits, &c., of Roman construction, there are a Corinthian temple of Augustus and Livia, remains of a theatre, and an obelisk, called L'Aiguille, 72 feet high; and the museum contains many relics of Roman antiquity. The cathedral of St Maurice (12th–14th centuries) is partly Romanesque, partly Gothic; portions of St Peter's date from the 6th century. There are important manufactures of linen and iron goods, and excellent wine is produced. Pop. (1921) 23,732.

Vienne, Haute, an interior dept. of France, south-east of the department of Vienne, bounded on the W. by Vienne, Charente, and Dordogne. Area, 2119 sq. m.; pop. (1872) 322,447; (1921) 350,235; (1926) 351,311. It is watered by the Vienne and its tributaries. The surface is for the most part level, though not fertile, but is traversed by ranges of low hills, including the Monts du Limousin. There is much cattle-breeding, while the production of kaolin and of porcelain is perhaps the most considerable in Europe; there are other manufactures. The dept. is divided into four arrondissements—Limoges, Bellac, Rochechouart, and Saint Yrieix; capital, Limoges.

Vierge, Daniel (1851–1904), a great painter and draughtsman, born in Madrid, settled in Paris in 1869, and there did most of his famous book-illustrations—to Michelet, Victor Hugo, *Don Quixote*, Don Pablo de Segovia, &c.

Viersen, a town of Rheinland, 20 miles NW. of Düsseldorf by rail, with manufactures of plush, silk, cotton, and flax. Pop. (1925) 32,037.

Vierzon, a French town in the dept. of Cher, 20 miles NW. of Bourges, with manufactures of agricultural and industrial machinery, porcelain, glass, &c. Pop. 11,400.

Vieta, Franciscus (*François Viète*; 1540–1603), a great French mathematician, was born at Fontenay-le-Comte, near La Rochelle. He studied law at Poitiers, practised there as an advocate, was councillor of the *Parlements* of Brittany and Tours, and privy-councillor to the king. Schooten collected most of his writings (Leyden, 1646).

Vieuxtemps, Henri, violinist and composer, was born 20th February 1820 at Verviers in Belgium, began to give concerts in his thirteenth year, and after completing his studies at Vienna and Paris spent most of his time in travelling from place to place as a performer till in 1870 he became a teacher in the Brussels conservatoire. He retired in 1873, and died 6th June 1881. His works comprise concertos, fantasias, and dances for the violin. See Kufferath, *Henri Vieuxtemps* (Brussels, 1883).

Vigan, Le, a small town of France, dept. Gard, 45 miles WNW. of Nîmes by rail. Tanning and silk-weaving are carried on.

Vigée Le Brun. See Le Brun.

Vigevano, a town of Northern Italy, 20 miles SW. of Milan by rail, with an old cathedral in a piazza surrounded by Renaissance porticos, and a fine castle, built by the Visconti and embellished by Lodovico Sforza (il Moro), who employed Bramante and Leonardo da Vinci, and built another castle 2 miles to the south-east, also from Bramante's plans. There are silk, cotton, and boot factories, and the country round is very productive. Pop. of commune (1921) 30,583.

Vigfusson, Gudbrand, Scandinavian scholar, was born in the district of Broadforth, Iceland, 13th March 1827, and studied at Copenhagen, where he lived from 1849 till 1864. In 1856 he was appointed one of the stipendiaries of the Arna Magnaean Commission. His master in the chosen work of his life was John Sigurdsson, to whom he dedicated his edition of *Eyrbyggja Saga* (Leip. 1864). Earlier and later works were his *Timatal* (1855), an essay in Icelandic on the chronology of the sagas; *Biskupa Sögur* (1858–78); the *Forn-Sögur* (with Th. Möbius, 1860); the *Flatejarbók* (with Unger, Christ. 1860–68); the *Icelandic Dictionary* (1873), undertaken by Cleasby, and carried on from 1864 by Vigfusson; the *Sturlunga Saga* (1878); and, with York Powell, the *Corpus poeticum boreale* (1883) and *Origines Islandicæ* (1905). In 1864 he had settled in London, whence he moved to Oxford, where he was appointed in 1884 lector in Icelandic, and died January 31, 1889. He had received the doctorate from Uppsala in 1877, the order of the Dannebrog in 1885.

Vigil, originally the watch kept, with public prayer, on the night before a feast, is traceable in the very earliest centuries, and is one of the usages against which Vigilantius inveighs, and which Jerome vindicates in his reply, though he admits the abuses that often accompanied it, which ultimately brought about its suppression. The old observance survives in the Roman Church now only in the Matins and Lauds and the midnight mass before Christmas, and the term is applied to the day and night preceding a feast, on certain of which fasting is obligatory (in England, on the vigils of Whitsunday, the Assumption, SS. Peter and Paul, All Saints, and Christmas). Vigils are marked in the Book of Common Prayer; no special services are appointed for them, but the collect of the next day is used at evensong. The 'watch-night' service at New Year (q.v.) is analogous.

Vigilance Societies, in the United States, include not only Regulators and other extreme exponents of Lynch Law (q.v.), but also the illegal associations which have sprung up from time to time in all parts of the country for the compulsory improvement of local morals, and the punishment of those who either refuse or fail sufficiently to reform their lives. Such organisations as the White Caps, at home in the eastern and central states, have for their professed objects the suppression of vice and idleness; they send formal warnings to those citizens whom they consider to be neglectful of their homes, too partial to card-playing, &c.; and if this warning be disregarded, inflict such punishment as whipping, destruction of property, &c. The methods of the White Caps are the same as those of the Ku-Klux-Klan (q.v.).

Vigilantius, an opponent of monachism and of the worship of martyrs and relics, was born at Calagurris in western Gaul in the later half of the 4th century. Ordained a presbyter at Barcelona in 395, he journeyed to Jerusalem carrying a recommendation from Paulinus of Nola to Jerome, whose whole theological system was as completely repellant to him as his vehement and intolerant temper. From Jerome's *Contra Vigilantium* we gather that he denounced the worship of martyrs and relics as a relapse to paganism, vows of celibacy and poverty as unnatural and creating a fictitious morality. See Gilly's *Vigilantius* (1844) and the article in Herzog-Hauck (1896–1909).

Vignette, properly an ornament like vine-twigs and leaves with grapes; but the name is now given to any small engraving (as on the title-page of a book), design, or photograph which is not circumscribed by a definite border.

Vigny, Alfred Victor, Comte de, French author, born of ancient family during his parents' imprisonment in the prison at Loches (Indre-et-Loire), 27th March 1797, entered the army at the Restoration, and served fourteen years. Garrison life wearied a soul athirst for glory, but his pride found a solitary consolation in verse. As early as 1822 he published anonymously a small volume of verse, followed in 1824 by *Eloa, ou la Sœur d'un Ange*, an exquisite piece of mystic phantasy. Before the Revolution of July he had published his collected *Poèmes antiques et modernes* (1826), containing *Moïse* and *Dolorida; Cinq Mars* (1826), a historical romance; a translation of *Othello* (1829); and a drama, *La Maréchale d'Ancre* (1830). After that year he published only works in prose: *Stello* (1832), *Grandeur et Servitude Militaires* (1835), and a drama, *Chatterton* (1835)—the highest moment of his fame. From that time he ceased not to write but to print. He left a volume of verse—*Destinées*—published in 1864, which contains some of his finest and most virile work, and a collection of personal notes, printed with doubtful wisdom by Louis Ratisbonne under the title *Journal d'un Poète* (1867). While still young he attached himself to the Romanticists, with Hugo, Deschamps, Mme. Desbordes-Valmore, and Mdlle. Delphine Gay. But he was never a militant or thorough-going member of the party—'he retired,' says Sainte-Beuve, 'to his ivory tower before the heat of the day.' His *Cinq Mars* was a romance based on the most tragic of the crimes of Richelieu, inspired by Scott, but intended to be minutely true to history throughout. The author's connection with the theatre led to an equivocal friendship with Mme. Dorval, commencing about the close of 1830, but the woman's heart soon found poetry a poor substitute for passion, and the tragedy left the poor idealist stripped of his last illusion. In 1845 Vigny was gratified by election to the Academy, on which occasion he made a long and wearisome address, which was listened to with unconcealed impatience. Thereafter till the close he lived but little in the world, in familiarity with no one, not even himself, his thoughts wrapped up in a pessimistic gloom from which he found escape only by the avenues of art. His was that profoundest kind of moral misery which needs no external reason for its being, incurable because itself its own poison. He died at Paris after the long agony of cancer, 17th September 1863. Vigny's work was elegant but cold. No poet has had grander conceptions than the few fundamental ideas that inform his work, and it is not so much inspiration as meditation that gives the key-note to all his poetry. 'It is formed,' says M. Montégut, 'not as beautiful living things are born, by fervent generation, but in the way those lovely, precious, and cold things are produced—pearls, coral, the diamonds, to which they have a close affinity—by agglutination, slow cohesion, invisible condensation.' His fundamental defect as a poet has been well stated by M. Faguet to be not by any means want of imagination, but rather a certain richness and suppleness of imagination, the result of which is not only that one of the most vigorous thinkers amongst poets has produced so little, but also that his most perfect work is ever marred by incompleteness and inequality. Vigny the artist is inferior to Vigny the poet; his poetic execution to his creation of poetic ideas. Quite unlike Hugo, whose magnificent execution casts a splendid veil over a certain fundamental poverty of ideas. But if a poet's domain be small, it is something if it be all his own, and Alfred de Vigny the poet was at least original. Perhaps, when all is said, Montégut is right in putting the three novels which compose *Servitude et Grandeur Militaires* as his finest work. 'The form of this book is noble as its thought, and simple as the souls whose silent sacrifice and obscure heroism it relates. . . . The day on which he wrote it he took counsel only with his own inborn nobility of nature, and gave their *congé* to all his feelings of bitterness and melancholy, as if to a troop of importunate and troublesome guests who hindered him from discovering his true self. Is it not piquant to see given by the mouth of a misanthrope himself, to the pessimistic doctrines of the misanthropes on human nature, the most eloquent denial they have received in our time?' An exquisite if uncertain artist, Vigny remained true to his fundamental definition, 'L'art est la vérité choisie.' To him genius was a sublime and fatal gift, which imprisoned him in grandeur, solitude, and sadness; the whole universe an arena of infamy and wrong; the stern decrees of fate to be endured with stoicism if possible; their individual victims to be regarded with a pity, profound indeed, although half begotten of contempt. Vigny married an Englishwoman (Lydia Bunbury) in 1828, and the influence of English taste is as marked in his work as in that of his contemporary, Alfred de Musset; indeed Gautier, in speaking of what he calls 'the intellectual fatherland' of his contemporaries, expressly says 'Musset and Vigny are English.'

The works were collected in 1863–66, 1868–70, 1883–85, and (the 'édition définitive' of the complete works) in 1903–4, the poems constituting one volume. See the monographs by Paléologue (1891), Dorison (1892), Lauvrière (1910); larger works by Dupuy (1910–12), and Séché (1916); various studies by Sainte-Beuve and Émile Faguet; and Gosse's *Profiles* (1905).

Vigo, a seaport on the north-west coast of Spain, on a deep bay or inlet, 20 miles SW. of Pontevedra by rail. Its beautiful situation and fine climate make it an admirable heath-resort. Pop. (1897) 17,044; (1920) 53,100. The Bay of Vigo has an inland sweep of 20 miles, and is 5 miles wide at its mouth. Vigo was taken by Drake in 1585 and 1589, and by Lord Cobham in 1719; and in 1702 the Spanish galleons, defended by a French fleet, were captured or destroyed by a British and Dutch force under Lord Ormonde and Rooke. See Cassiterides.

Vihara. See India, p. 108.

Viipuri. See Viborg.

Vijayanagar, a ruined city 8 miles in circuit, in Madras province, about 40 miles to the NW. of Bellary, in a plain encumbered with granite rocks, many of which have been rudely sculptured into a variety of forms. After having been for two centuries the metropolis of a powerful Hindu kingdom, Vijayanagar was sacked and ruined by the Mohammedans of the Deccan in 1565. At that date it is described as 24 miles round. The ruins

of the ancient city, the building of which was begun in 1336, now cover 9 sq. m. The modern village on its site is called Hampi.

Viking (Dan. ; Icel. *vikingr ;* O. E. *wicing*), a name given to the piratical Northmen who infested the coasts of the British Islands and of France in the 8th, 9th, and 10th centuries. This word is quite unconnected with 'king,' and used to be commonly derived from the Scandinavian *vik*, 'a bay' (as in Lerwick, &c.) ; but while *vikingr* is late Icelandic, *wicing* is found very early in English and Frisian. The word may therefore be Anglo-Frisian. See NORTHMEN.

Vikramaditya. See INDIA, p. 115.

Világos. See GÖRGEI.

Vilkomir, a town of Lithuania, 130 miles S. by E. of Riga ; pop. 10,000, largely Jews.

Villach, a town in Carinthia, Austria, on the river Drave, 52 miles NW. of Laibach. It has a church of the 14th and a town hall of the 16th century, and manufactures of machinery, paper, &c. There are sulphur springs in the neighbourhood. Pop. (1923) 16,803.

Villa Encarnación, 180 miles south-east of Asunción, the capital of the department of Encarnación in the republic of Paraguay. Situated on the Paraná, opposite the Argentine town of Posadas, it is the centre of the *yerba maté* trade, and is the terminus of the Paraguayan Central Railway. Pop. about 28,000.

Villafranca di Verona, a town of Italy, 9 miles SW. of Verona by rail, where in 1859, after the battle of Solferino (q.v.), peace was concluded between Austria and France on the basis of the cession by the former to Italy of Lombardy, but not of Venetia, which was not won until 1866. Pop. of commune (1921) 12,174.

Village Communities, the means by which many scholars contend that great part of Europe must have been brought into cultivation. A clan of settlers took a tract of land, built their huts thereon, and laid out common fields, which they cultivated in common as one family. The land was divided out every few years into family lots, but the whole continued to be cultivated by the community subject to the established customs as interpreted in the village-council by the sense of the village-elders. This may still be seen in the villages of Russia, and even in some parts of England may still be traced the ancient boundaries of the great common field, divided lengthwise into three strips (one fallow, the two others in different kinds of crop), and again crosswise into lots held by the villagers. This theory, often called the Mark system, was started by Von Maurer in Germany, but mainly owes its currency to Sir Henry Maine, who pointed out close parallels in the archaic land communities in India. The first serious attack upon the theory was made by F. Seebohm, who laboured to prove that the ancient village community was not originally free, but can be traced back to the Roman manorial system of a community in serfdom under a manor with its lord. Fustel de Coulanges dealt Von Maurer's theory a still more deadly blow by turning against him the evidence of the Leges Barbarorum and early chartularies on which his argument mainly relied. He proved also that the Russian *mir* did not represent agrarian communism, the soil belonging not to it but to some one else, and the peasants merely paying rents collectively as well as cultivating the land collectively. The primitive *Mark*, the association of the Mark (*Markgenossenschaft*), the original common-land (*Gemeinland* or *Allmende*)—all the evidence for these he weighs and finds wanting, contending that the whole imposing structure of argument has been erected out of a series of misunderstandings, national communism having been confused with the common ownership of the family, tenure in common with ownership in common, agrarian communism with village commons. On the other hand, the fact that the English language, law, and literature are all Teutonic, and the utter disruption of the Roman society at the Saxon invasions, point in favour of the Teutonic (as opposed to the Roman) origin of the manor in England.

Sir G. L. Gomme considered Lauder and Kells as surviving types of the tribal community in its most primitive form ; besides the example of Hitchin, from which Seebohm started working back, he examined the cases of Aston village, in the parish of Bampton, Oxfordshire, Chippenham in Wiltshire, Malmesbury, and others, his conclusion being that the village community is no modern institution, but one beginning far back in the history of human civilisation, and probably a phase through which all peoples have passed. In the hill cultivation and settlement, of which many traces remain, he saw evidence of pre-Aryan influence analogous to similar customs surviving in India. The community in its tribal form was the prominent feature, the village of serfs the subordinate : groups of kindred occupying their several homesteads and the lands around ; small villages of serfs occupying cottage homes massed together, and using the lands around them in intermixed or run-rig occupation. Thus Seebohm's formula, defining the English institution as a manor with a village community in serfdom under it, he would rewrite as a tribal community with a village in serfdom under it.

See Von Maurer, *Geschichte der Markverfassung* (1856) ; Nasse, *Agricultural Community of the Middle Ages* (1871) ; Maine, *Village Communities in East and West* (1871) ; Lavelaye, *Primitive Property* (trans. 1878) ; Seebohm, *English Village Community* (1883) ; Gomme, *Village Community* (1890) ; Fustel de Coulanges, *Origin of Property in Land* (trans. 1891) ; Vinogradoff, *Villainage in England* (1892), and *Growth of the Manor* (1905) ; Baden-Powell, *Village Community of India* (1897) ; Maitland, *Domesday Book and Beyond* (1897) ; Peake, *The English Village* (1922) ; various standard constitutional and economic histories, especially Lipson, *Economic History of England* (1915) ; also the articles, FEUDALISM, GAU, LAND LAWS, MANOR, RUN-RIG, RUSSIA (*Government*), SLAVERY.

Villa'ni, GIOVANNI (? 1275–1348), a Florentine chronicler often cited.

Vil'lari, PASQUALE (1827–1917), historian, born at Naples, took part in the Neapolitan revolution of 1848, was professor of History at Florence 1866–1909, and repeatedly sat in the Italian parliament. *Pasquale Villari—L'Italia e la Civita* (1917) ed. Bonacci, contains selected passages from his works, of which the best-known are Lives of Savonarola (1859) and of Machiavelli (1877–82), *The First Two Centuries of Florentine History* (1894–96), *Barbarian Invasions of Italy* (1902), all translated by his English wife, *née* Linda White (1836–1915), herself a novelist. Their son, Luigi Villari (b. 1876) is known as a publicist, author, and traveller.

Villa Rica, the third largest town in Paraguay, is in the department of Guaira, 93 miles SE. from Asunción ; it is served by the Paraguayan Central Railway, and has a large trade in *yerba maté*, or Paraguay tea. Pop. 26,000.

Villarreal, a Spanish town 40 miles NE. of Valencia, in an orange-growing district ; pop. (1920) 16,770.

Villars, CLAUDE LOUIS HECTOR, DUC DE, marshal of France, one of the most illustrious of the great captains of Louis XIV.'s time, was born at Moulins, 8th May 1653. He distinguished himself

in the wars of the Low Countries, on the Rhine, and in Hungary, fighting against the Turks. From 1699 till 1701 he represented France at Vienna, and by his sleepless vigilance foiled the tortuous policy of the Austrian ministers. On his return he was employed in Italy under Villeroi, and was for the first time (1702) raised to independent command, when he was sent to succour the Elector of Bavaria. Towards the close of 1702 Villars crossed the Rhine, defeated the Markgraf of Baden at Friedlingen, and next year again crossed the Rhine, traversed the Black Forest, and joined the Elector. His bold scheme for advancing upon Vienna was defeated by what he regarded as the stupid obstinacy of his colleague, the Elector; and after his skill and genius had been taxed to the utmost to keep the Austrians at bay, and he had been relieved, he returned in disgust to France. He was next commissioned to put down the insurrection of the Camisards (q.v.). Villars was then sent to watch over the north-eastern frontier, which he successfully defended against Marlborough, who retreated; upon which Villars entered Alsace and captured the enemies' reserves of supplies and artillery. In 1708 he defeated all the attempts of Prince Eugene to penetrate into France. In 1709 he was sent to oppose Marlborough in the north; but at the commencement of the battle of Malplaquet (q.v.) he was severely wounded, and rendered unfit for service. But in 1711 he headed the last army France could raise, and with it fell upon the British and Dutch under Albemarle, who were entrenched at Denain (24th July 1712), carried their entrenchments sword in hand, and captured the most of them; he then turned upon Prince Eugene, and drove him under the walls of Brussels. This magnificent series of successes saved the honour of France, and brought about the peace of Rastatt (q.v.), which Villars signed as plenipotentiary, 6th May 1714. After the peace he became the principal adviser on military affairs and on questions of foreign policy; was a strong opponent of Law's financial measures; but through the intrigues of Fleury lost favour at court. The outbreak of war in 1732, however, brought out the old hero from his retirement, and he went to head the French army in the Milanese. The campaigns of 1733–34 showed that the weight of years had left Villars' military genius and spirit untouched; but discontent with his ally, the king of Sardinia, determined him to solicit his recall; and he accordingly set out for France, but fell ill at Turin, and died 17th June 1734.

See his *Mémoires* (ed. by De Vogüé, 2 vols. 1884–91), and the biographies by Anquetil (1784), Giraud (1881), and De Vogüé (1888).

Villarsia. See LIMNANTHEMUM.

Villefranche, French town in the dept. of Rhône, on the right bank of the Saône, 20 miles NW. of Lyons, has manufactures of cotton and machinery, and some old houses; pop. 17,000.—(2) Villefranche-de-Rouergue, in the dept. of Aveyron, 70 miles NE. of Toulouse, has pop. of 7000.—(3) Villefranche-sur-Mer, a port in the dept. of Alpes Maritimes, was founded in the 14th century. The harbour is used by ships of war, while the climate is very fine. Pop. 3000.

Villehardouin, GEOFFROI DE, the first, and far from the least, of French historians, was born about 1160 at Villehardouin in Aube, took a distinguished part in the so-called Fourth Crusade—the complicated and entirely secular operations in alliance with Venice that established the Latin empire of Constantinople—became marshal of Romania, seigneur of 'Messinople' in 1207, and was dead before 1213. His famous *Conquête de Constantinople* relates with order and clearness the course of events from the preaching of the crusade in 1198 down to the death of his patron, the Marquis de Montferrat, in 1207. It is probable, as Gaston Paris says, that he did not write himself, and that we should take in its proper sense—which is not always the case in Old French—the word *dicter* which he uses several times in speaking of the composition of his book. The style is vigorous, direct, often singularly strong and graphic without effort or even consciousness; yet preserving from the preceding age something of the epic tone, it recalls the *Chanson de Roland* just as Herodotus recalls Homer. Sincere history as it is, it is of far greater value as literature than history, for it throws the strongest light upon the thoughts and feelings of the crusaders, especially the leaders. Strange to say, it is supplemented here by another prose narrative of a sharer in the crusade, Robert de Clari, whose book is much less admirable in style, but reveals the inner life of the crusaders of lower rank.

Editions are by Du Cange (1657), Dom Brial (1823), and especially N. de Wailly (1872; 3d ed. 1882). See Sainte-Beuve's *Causeries du Lundi*, vol. ix., and *Extraits*, ed. Paris and Jeanroy (1905).

Villein. See SLAVERY.

Villemain, ABEL FRANÇOIS, scholar and critic, was born at Paris, 11th June 1790, and at twenty was appointed professor of Rhetoric at the Lycée Charlemagne, shortly after at the École Normale. He filled the chair of Eloquence at the Sorbonne (1816–26), held various government offices under Louis XVIII., was made a peer in 1831, and served as minister of Public Instruction under Soult and Guizot, retiring in 1840. He was long perpetual secretary of the French Academy, and died 8th May 1870.

His principal works are the invaluable *Cours de Littérature Française* (1828–30), *Mélanges* (1823) and *Nouveaux Mélanges* (1827), *Souvenirs Contemporains d'Histoire et de Littérature* (1853), *Choix d'Études sur la Littérature Contemporaine* (1857), *La Tribune Contemporaine*, *M. de Chateaubriand* (1857), *Essais sur le Génie de Pindare et sur la Poésie Lyrique* (1859). His *Histoire de Cromwell* (1819) and *Lascaris, ou les Grecs du XV^me^ Siècle* (1825), brought him great popularity.

Villemarqué. See LA VILLEMARQUÉ.

Villena, a town of Spain, 25 miles NW. of Alicante by rail, with manufactures of linen and soap, and a pop. of 16,500.

Villeneuve, the name of numerous French towns, the largest Villeneuve-sur-Lot, or d'Agen, in Lot-et-Garonne, 15 miles N. of Agen by rail, with trade in wine and fruit, interesting mediæval walls and houses, and a pop. of 11,000.

Villeneuve, PIERRE CHARLES JEAN BAPTISTE SYLVESTRE DE, Nelson's antagonist at Trafalgar, was born at Valensoles (Basses-Alpes), 31st December 1763, entered the navy in his fifteenth year, and passed as captain at thirty. Captain of division by 1796, he commanded the rear division at the battle of the Nile, and saved his own vessel, the *Guillaume Tell*, and four others. Vice-admiral in 1804, he next year took command of the Toulon squadron. At Cádiz he was joined by the Spanish fleet under Gravina, and, in order to keep the British fleet from the coasts of Europe, bore away westwards across the Atlantic, reaching the Antilles on 14th May. A month later he sailed back, still pursued by Nelson. Off Ferrol he fought an undecided battle with Sir Robert Calder, and, unable to reach Brest, again returned to Cádiz, where he was strictly blockaded by Nelson. This completely ruined Napoleon's scheme for the invasion of England, and Villeneuve, knowing that he was about to be

superseded, determined to fight Nelson before his successor could arrive at Cádiz. On that memorable day of English glory Villeneuve's flag-ship, the *Bucentaure*, was dismasted and forced to strike. The admiral lay a prisoner in England till April 1806. On the journey to Paris he stopped at Rennes to learn how the emperor would receive him. On the morning of April 22 he was found dead in bed, with six knife-wounds in his heart. See NELSON.

Villeroi, FRANÇOIS DE NEUVILLE, DUC DE, French marshal, was born 7th April 1644, and educated at court with Louis XIV., but was banished to Lyons for a love-affair. In 1680 he returned to court, and in 1693 became a marshal, having distinguished himself at Neerwinden. As commander in the Netherlands in 1695–96 he showed great incapacity; and sent in chief command to Italy in 1701, he was there defeated and taken prisoner by Prince Eugene. Again he commanded in the Netherlands, but was defeated by Marlborough at Ramillies. Madame de Maintenon got him made guardian to Louis XV. Orleans sent him to live on his estate in 1722, because of his intrigues; but he was subsequently governor of Lyons, and died at Paris, 18th July 1730.

Villers-Bretonneux, a French town, dept. Somme, 10 miles E. of Amiens, was the scene of much critical fighting in April and August 1918, the town being largely destroyed; pop. 2500.

Villers-Cotterêts, a French town, dept. Aisne, 14 miles SW. of Soissons, was the scene of severe fighting in 1914 and 1918. The elder Dumas was born here. Pop. 4200.

Villiers. See BUCKINGHAM (DUKE OF).

Villiers, CHARLES PELHAM (1802–98), corn and poor-law reformer, was a younger brother of the fourth Earl of Clarendon, and was educated at Haileybury and Cambridge and called to the bar at Lincoln's Inn in 1827. He was returned for Wolverhampton as a Free Trader in 1835, and sat its constant and consistent member till his death. He held cabinet rank as President of the Poor-law Board (1859–66).

Villiers de l'Isle Adam, PHILIPPE AUGUSTE (1838–89), Breton count and French poet, was descended from the last Grand Master of the Knights of Malta, and is reckoned the herald of the Symbolist movement. A writer of vivid imagination and exceptional power, an idealist and a strong Catholic, he made a mark by his poems, romances, stories, prose plays, and satires—*Contes Cruels* (stories), *L'Ève Future* (satire), and *Axël* (drama) being amongst his most remarkable works. He died penniless, of cancer, in a Paris hospital. See Lives by du Pontavice de Heussey (1893), de Rougemont (1910), and Clerget (1913).

Villon, FRANÇOIS, was born of poor parents in or near Paris in 1431. Details of his life are scanty, and little more is known than what he tells us himself. His own name was probably François de Montcorbier (or perhaps François des Loges), but in gratitude he adopted the name of his 'more than father' Maistre Guillaume Villon, a cleric, wealthy and benign. François became Bachelor of Arts at the University of Paris in 1449, and Master in 1452. In June 1455 in a street squabble he was savagely attacked and forced to defend his life, and had the ill-luck to kill a priest. He fled from Paris, but after receiving a pardon from the king, returned in January 1456. His next trouble was with a love affair with one Katherine de Vaucelles, and in his *Petit Testament* (December 1456) he talks of going to Angers to escape from a hopeless passion. In 1457, it came out, through the forced confession of a friend of his, Guy de Tabarie, that he was one of a gang of burglars who had broken into the Collège de Navarre and had stolen some 500 crowns, at the end of the previous year. Meanwhile Villon had disappeared into the provinces, but little is known about his doings. He went to Angers, came in touch with the Duc de Bourbon at Moulins, and with the Duc d'Orléans at Blois (where apparently he also suffered imprisonment), drifted to Roussillon, and passed the summer of 1461 in a cell, or rather pit, in the prison of the Bishop of Orleans at Meung-sur-Loire. What the crime was is uncertain. Louis XI. passed through Meung, 2d October, and ordered a gaol-delivery in honour of his accession, whereupon Villon returned to Paris, and about this time wrote the *Grand Testament*. In November 1462 he was arrested for robbery, but released; arrested for brawling, and this time condemned to death. He appealed successfully to parliament against the sentence, and was banished from the capital for ten years. In January 1463 he went away from Paris, and was never heard of again. Rabelais has a story of his 'vieux jours,' but before the century was out he had evidently become one of those legendary characters to whom stray stories are affiliated, as is shown by the *Repeues franches*, and by the other story told by Rabelais, which is at least two centuries older than Villon. That he survived his appeal many years is most unlikely. He speaks of himself as a dying man, and it is clear from his own words that he was a wreck, shattered by debauchery, prison-life, and torture, and from one passage it would seem far gone in consumption.

Villon's works consist of the *Petit Testament*, the *Grand Testament*, and some forty short pieces, chiefly ballades, many of which are imbedded in the *Grand Testament*. The seven *Jargon* ballades, written later than the *Grand Testament*, and in the slang of the Coquillards (a band of rascals who made their money by burglary and other illegal methods), are probably genuine. Villon stands out as the first modernist in French poetry, the first poet whose personality shines out in his work—vivid, realistic, and fiercely human, while the *Grand Testament* is an amazing display of fancy and seriousness, of irony and simplicity. Readers of Villon generally pass through three stages of feeling with regard to him. The first introduction is usually through selected specimens, like 'The Ladies of bygone Days,' his mother's 'Prayer to our Lady,' the 'Epistle to his Friends,' and fascination is the inevitable consequence. Unrestricted acquaintance is almost sure to lead to disgust with the revolting atmosphere of rascality one is forced to breathe in his company. But there is still room for pity. The undercurrent of profound sadness that runs through all his seeming recklessness does not make itself fully felt at the first or second reading, nor yet the pathos that lies in the glimpses he gives of a sense of his own degradation. The repulsion is perhaps as strong as ever—'but yet the pity of it!' Some there are, indeed, who are not repelled but rather attracted by the infamy of Villon's life. Others, again, maintain that Villon the poet was born of Villon the burglar and blackguard, though it is not clear upon what grounds they rest their assertion that if he had not been a gaol-bird he would have been songless. Villon, however, was no *poseur*. He had the manliness to acknowledge that the miserable bed he lay upon was of his own making.

The first dated edition of Villon's poems is that of Pierre Levet, 1489, Paris, but the earliest is possibly undated. By 1542 thirty-two editions had been printed, that of 1533 having been edited by Clément Marot, but no edition appeared between 1542 and 1723. In the 18th century there was a reaction, while in the latter half of the 19th century a great revival of interest took place.

The most important modern editions with critical introductions are those of Longnon (1892; new ed. 1914) and Schwob (1905), but those of Prompsault (1832), Lacroix, 'Bibliophile Jacob' (1854, 1866), Jannet (1876, 1884), Moland (1879), and Seché (1910) are also good. See Vitu, *Notice sur François Villon* (1873), and *Le Jargon du XV^e Siècle* (1884); valuable biographical works by Longnon (1877), Paris (1901), and Champion (1913); Bijvanck, *Essai sur Villon* (1882); Marthoid, *Le Jargon de Villon* (1909); Schwob, *Redactions et notes* (1912); and the *Life* (1916) by de Vere Stacpoole. See also Sainte-Beuve, *Causeries du Lundi*, vol. xiv., Gautier, *Les Grotesques*, R. L. Stevenson, *Familiar Studies*. Complete English translations have been made by Payne (1878; new ed. 1892), and de Vere Stacpoole (1913), while several separate poems have been translated by Swinburne, D. G. Rossetti, A. Lang, &c.

Vilna (*Vilnius;* Polish, *Wilno*), titular capital of Lithuania, since 1920 in the hands of the Poles, formerly capital of a government of Russia, 225 miles NE. of Warsaw. It has some interesting old palaces and churches, a 14th-century Roman Catholic cathedral, and a university (founded 1578); there is some trade in timber and in corn. In the latter Middle Ages Vilna was the capital of the grand-duchy of Lithuania, then became a centre of Polish influence. During and after the Great War it was occupied in turn by Germans, Lithuanians, Bolsheviks, and Poles. In 1920 the Soviet government ceded Vilna to Lithuania, but the town was the same year seized by the Poles, under the White Russian filibustering general Zeligowski. Pop. (1875) 82,668; (1914) 214,600; (1921) 128,954, both Lithuanians and Poles, but also many Jews.

Vimeiro, also spelt Vimieiro and Vimiera, a town of 1800 inhabitants in the Portuguese province of Estremadura, 30 miles N. of Lisbon. Here Wellington defeated Junot, 21st August 1808.

Vimy Ridge, an eastern spur of the ridge Notre Dame de Lorette, some 5 miles NE. of Arras, and associated with the Canadians who made a brilliantly successful attack here against the Germans in April 1917.

Viña del Mar, a marine suburb of Valparaíso, lying three miles north-east of the centre of the town. It is a pleasant and healthy place with good hotel accommodation, and is a favourite resort in the summer months. Pop. about 35,000.

Vinaroz, a small port of Spain, 45 miles NE. of Castellón by rail; pop. (1920) 7846.

Vinca. See PERIWINKLE.

Vincennes, an eastern suburb of Paris, just outside the fortifications, whose park, the Bois de Vincennes, is the pleasure-ground of eastern Paris. The 14th-century castle, founded by Philip VI., and enlarged by later kings, remained a royal residence till 1668, when the court removed to Versailles. It then became a state prison, and in 1834 was made a fort of the inner line of fortifications. The Duc d'Enghien was shot here. The keep is still well preserved, while there is some good stained glass in the chapel. In the Bois, which extends for over 2300 acres, are exercise grounds for infantry and artillery. There are in Vincennes barracks, hospitals, and a good deal of varied manufacturing industry. Pop. (1921) 41,527.

Vincennes, capital of Knox county, Indiana, on the navigable Wabash, 52 miles by rail N. of Evansville. It contains a Roman Catholic cathedral, various manufactures, with oil wells in the vicinity, and is the oldest town in the state, being settled by the French in 1735. From 1800 to 1813 it was the capital of the North-west Territory. Pop. 17,000.

Vincent, ST, deacon and martyr, born at Hulsea in Spain, was under Diocletian's persecution imprisoned and tortured at Valencia, dying in 304. His day is the 22d January.—For the island, see ST VINCENT.

Vincent de Beauvais. See ENCYCLOPÆDIA.

Vincent de Paul, one of the most eminent saints of the modern Catholic Church, was born of humble parentage at Pouy near Dax in Gascony, in 1576 (or in 1580). He studied at Toulouse, and was admitted to priest's orders in 1600. On a voyage from Marseilles to Narbonne his ship was captured by corsairs, and he with his companions sold into slavery at Tunis. His master, a renegade Savoyard, yielded to the exhortations of Vincent, and resolved to return to the Christian faith, so, escaping from Barbary, they landed in France in 1607. Having gone thence to Rome, he was entrusted with a mission to the French court in 1609, and became almoner of Henry IV.'s queen, Marguerite de Valois. As pastor of Clichy and of Châtillon, he formed associations for helping the sick, visited prisons and galleys, and in 1619 was appointed almoner-general of the galleys. The tale is told, but lacks authority, that in 1622 he took the place and wore the fetters of a galley-slave, whose heart he had failed to reach otherwise. Meanwhile he had laid the foundation of what eventually grew into the great and influential congregation of Priests of the Missions, an association of priests who assist the parochial clergy by preaching and hearing confessions periodically. The rules of this congregation were finally approved by Urban VIII. in 1632; and in the following year the Fathers established themselves in the so-called Priory of St Lazare, in Paris, whence their name of *Lazarists* is derived. From this date his life was devoted to the organisation of splendid works of charity and benevolence. To him Paris owes the establishment of the Foundling Hospital. The noble Sisterhood of Charity (see SISTERHOODS) was of his founding, while Vincent took a great interest in the ransoming and welfare of the slaves of Barbary. He died at St Lazare, 27th September 1660, and was canonised by Clement XII. in 1737. His festival is held on the 19th July.

There are Lives in English by Wilson (1873) and Sanders (1913); in French by Abelly (1660: new ed. 1891), Collet (1748), Maynard (1850-74), Bougaud (1889: trans. 1899) and E. de Broglie (trans. 1906).

The Society of Vincent de Paul was founded at Paris in 1833 by eight young men, of whom Ozanam (q.v.) was one, for the purpose of helping the poor, and chose St Vincent de Paul as patron. The society, which has branches in all parts of the Catholic world, devotes itself to relieving the poor, founding and managing libraries for their use, establishing crèches and dispensaries, visiting prisoners, and finding employment for men out of work. Occasionally sums of money are raised by the society to relieve distress in cases of famine or other disastrous visitations.

Vincentius Lerinensis. See LÉRINS.

Vinci. See LEONARDO DA VINCI.

Vindhya Mountains. See INDIA, pp. 98, 99.

Vine. Of the genus Vitis, including Ampelopsis and Cissus which some would reckon separate genera, there are some hundreds of species; they are found over a wide range in tropical and warm temperate countries of the northern hemisphere, many in temperate Asia and in North America. The genus belongs to the family Vitaceæ (q.v.). It has pentamerous flowers (five-toothed calyx forming a small cup, five petals, and five stamens); the petals are attached to the disk at the base of the ovary, but, contrary to general rule, they

adhere at the top and form a cap, which is thrown off by the stamens as they elongate and expand; the latter adhere for a time to the base of the fruit. All the species are furnished with claspers by which they lay hold for their support on any object within their reach (see TENDRIL). Some have leaves greatly lobed, others have them nearly plain.

Vitis vinifera, the European wine-yielding grape-vine, is that which has greatest economic and

Vine (*Vitis vinifera*).

commercial importance. It is found on the shores of the Caspian Sea, and it grows wild throughout the lower Caucasus and in Armenia. The cultivation of this plant has occupied much of man's time and attention in all nations that have attained to any degree of civilisation, from the very dawn of history. There is an endless variety of grape-vines in cultivation. Seed taken from any variety of grape does not reproduce the parent, but one widely different, and as a rule very inferior to the parent, except in exceedingly rare instances, when a step in advance may be taken. The plant has evidently been developed by the ingenuity of man at some very remote date, of which there is no record, just as our apples, plums, pears, peaches, and many other fruits and vegetables have been; and if man's constant care were withdrawn from their cultivation they would soon disappear.

By many Persia is thought to be the home of the grape-vine, and excellent wine is still made there and exported. In European graves of the Bronze Age (q.v.) grape stones have been found, and in Greece and Italy the culture is primeval. The culture of wine on a commercial scale is dealt with in the article WINE and in the articles on the wine-growing countries. In Europe now the line of open-air culture of the vine on a large scale passes from the country just north of the Loire in France through Belgium, central Germany, and Silesia; but in the middle ages wine was largely produced north of this—in North France, Holland, and in England. People then were content with inferior wines.

The cultivation of the grape-vine was introduced into England by the Romans. At the date of the Norman Conquest there is evidence that the vine was pretty extensively cultivated in the south and south-west of England for the production of wine until about the middle of the 18th century, when for this purpose its cultivation was given up, and it was grown for dessert purposes against walls and dwelling-houses with considerable success, and continues to be so grown up to this date. The finer sorts can only be cultivated in Britain in hothouses.

The soil most suitable for the vine in Britain is a good calcareous, wheat soil. Turf taken from such land, stacked in narrow ridges for a winter, may be chopped down in the spring, and if clay is in excess, it should have burned clay or old lime rubbish mixed with it in the proportion of 1 to 10. The best manure for a vine border is one into which finely-ground bones, horn shavings, and other phosphatic manures enter, not forgetting potash. It is well to avoid stable manure, as that very frequently breeds fungi. On the other hand, cow manure sours the soil, and should also be avoided.

The Rhine growers prefer soil nearly all made up of the scoriæ and debris of the rocks, and avoid soils which in England are found most suitable; for while these would grow grapes well, they do not yield wine of the desired bouquet.

The vine is easily propagated in a variety of ways—by layers, by cuttings, by eyes; also by budding, inarching, and grafting, as well as by raising from seed. The common method of establishing vineyards for open-air cultivation in grape-growing lands is to trench the soil where the land is hard, and to plant young canes at distances of from 3 to 4 feet apart, and 4 to 5 feet between rows, placing a stake to each young vine for its support. In the second year fruit can be produced, though it is better for the ultimate success of the vineyard not to crop till the third. Another method—more laborious and costly, and showing in greater ultimate advantage—is to put the vine cuttings in 'nursery rows,' to let them form roots there (as with gooseberry cuttings), and then transplant. Much of the labour required for growing grapes either in the open or under glass is devoted to pruning and training the plants. Various systems of pruning are in use, for securing greater vigour in the plant, to obtain more and better fruit, to keep up a constant supply of fruit-bearing wood, and to maintain the fruit-bearing portion, not on the extreme branches only, but near the ground. Nothing can well be less like the great vines grown under glass than the ordinary vine of a French or German vineyard, the vines being kept to some 3 or 4 feet in height, so that the uninitiated thinks rather of a raspberry garden than of a vineyard. In Italy greater luxuriance is allowed, and vines are even trained on trees pruned for the purpose.

The vine is very fruitful, and would soon exhaust itself by over-production; hence the clusters have to be carefully thinned. The extent to which thinning is necessary depends on the strength and size of the plant. The berries on the clusters also usually require thinning.

Of vine diseases, some are caused by insects—weevils, caterpillars and larvæ of various kinds; of these the most destructive is the Phylloxera (q.v.); of various fungoid diseases, Oïdium has been most harmful.

Phylloxera came from America, and from America came the remedy. Though *V. vinifera* does well in the western United States it proved a failure in the east, where several American species, notably *V. Labrusca*, and hybrids between these and *V. vinifera* are in cultivation. It was found that American vines resisted Phylloxera, and American stocks were introduced in European vineyards to graft *V. vinifera* upon. See also VINLAND.

The vine was introduced into Australia by the first settlers in 1788. From Sydney it spread over Australia. Outside of the Murray basin the Hunter River valley in New South Wales is the chief wine-growing district.

For other species of Vitis, some of which are

sometimes placed in separate genera, see VIRGINIA CREEPER.

See WINE, RAISINS, CURRANTS; and A. G. Perold, *A Treatise on Viticulture* (1927).

Vinegar is diluted acetic acid made by the oxidation of weak alcohol, the alcohol being derived from malted cereals or other saccharine substance. Malt vinegar, as its name implies, is made by preparing a wort either from malted barley alone or from a mixture of malted and unmalted cereal. The wort is prepared as in the manufacture of beer and is fermented with yeast, the liquid is then diluted so as not to contain more than ten per cent. of alcohol, and is acetified either by exposure to warm air or by the action of micro-organisms; oxidation of the alcohol takes place and produces acetic acid, aldehyde, and some esters, all of which add flavour to the vinegar. In the quick vinegar process the alcohol is sprayed over birch twigs or charcoal infected with *Mycoderma aceti*, and by means of a pump the liquid is kept circulating. Air is allowed free access by openings in the side of the containing vessel and oxidation is complete in some hours. The resulting liquid is next purified by the addition of finings or by the action of potassic ferrocyanide, the latter substance by removing some of the nitrogenous constituents gives a vinegar of better keeping qualities.

Vinegar made in this way is coloured and contains traces of the products of alcoholic fermentation which impart to it its peculiar flavour and aroma. Vinegar is also made by the fermentation and acetification of glucose sugar, but it lacks the flavour of the product from malt. White vinegar as sold in this country is mainly ordinary acetic acid, made by the distillation of wood, diluted down to about three to four per cent. The manufacture of wine vinegar is practically confined to the Continent; it is made by treating weak wines by the action of acetifying organisms; it always contains a small quantity of alcohol.

Some vinegars are flavoured with vegetable extracts such as taragon, chilli, garlic, &c. Vinegar has slight antiseptic properties, hence its use in preserving vegetables in the form of pickles.

Vinegar-eels. See EEL.

Vinegar-fly. See FRUIT-FLY.

Vinegar Hill (389 feet high), close to the town of Enniscorthy, in County Wexford, scene of the complete defeat of the Irish rebels by General Lake, June 21, 1798. They had held their camp here for about a month, and disgraced their cause by ruffianly outrages on the lives and property of the loyalists in the surrounding country. About 400 of the rebels were cut down, the remainder fled in headlong rout to Wexford, whither Lake marched the day after, killing all whom he found with arms. See Lecky's *History of England in the Eighteenth Century*.

Vinegar-plant (*Penicillium glaucum*), a fungus of the sub-order Hyphomycetes, but somewhat resembling those known by the name of Mould (q.v.). It forms a flocculent mass or web, which is tough and crust-like or leathery, and when examined by the microscope is seen to consist of a *mycelium* of branched threads, with the branches somewhat tangled, and the spores disposed in patches about the pencil-shaped ends of fertile threads. It is found on decaying bodies and in fluids undergoing the acetous fermentation, which it greatly promotes, and indeed readily occasions, a small piece placed in sugar and water soon changing it into vinegar. Advantage is sometimes taken of this property for making vinegar.

Vinet, ALEXANDRE RODOLPHE, Swiss divine and critic, was born at Ouchy near Lausanne, June 17, 1797, studied there, was appointed at twenty to the chair of French Language and Literature in the gymnasium of Basel, in 1835 in the university itself. He had been ordained in 1819, and in 1837 he accepted the chair of Practical Theology at Lausanne. His attitude to the question of the relation between church and state was shown already in his prize essay for the Paris Société de la Morale Chrétienne, *Mémoire en Faveur de la Liberté des Cultes* (1826), and he soon found himself involved in the struggle against state interference. He withdrew from the Vaud canton association of clergy (1840), but after the democratic attack of 1845 upon the 'fanatics' without, and the Evangelicals within, the state church, resigned his chair, and at the close of the year joined the newly-formed Free Church of Vaud. Meantime he had been appointed professor of French Literature in the Lausanne Academy, but this office he was compelled to resign in 1846. He died at Clarens, 4th May 1847. Vinet was an eloquent and earnest preacher, clear and brilliant, evangelical and orthodox, yet an advocate of the utmost liberty and toleration of opinion and practice in matters of religion, with separation from the state. He possessed fine critical insight and a profound knowledge of French literature, and his *Chrestomathie Française* (1829), his study of Pascal (1848), his *Études* on the literature of the 19th century (3 vols. 1849–51), his *Histoire* of 18th-century literature (2 vols. 1853), the *Moralistes des XVI. et XVII. Siècles* (1859), and his *Poètes du Siècle de Louis XIV.* (1862) take rank with the best contemporary work of their kind. It was at his initiative that Sainte-Beuve came to Lausanne to deliver his famous lectures on Port-Royal. In ethics Vinet owned Pascal and Kant as his masters.

The chief of his books that have been translated into English are *Christian Philosophy* (1846), *Vital Christianity* (1846), *Gospel Studies* (1851), *Pastoral Theology* (1852), *Homiletics* (1853), *Studies in Pascal* (1859), *Outlines of Philosophy and Literature* (1865). See the Lives by E. Rambert (1875; new ed. 1912), Chavannes (1883), Molines (1890), Lane (in Eng. 1890), and Schumann (1907); also his Letters edited by Secrétan and Rambert (2 vols. 1882), de Pressensé (1890), and Geymüller (1901).

Vingt-et-Un, a game of cards, the aim in which is to get as near as possible to the value of twenty-one (hence the name) without exceeding it. The game is played with the whole pack, the ordinary cards being reckoned according to the number of pips on them, while the court-cards are ten, and the ace is one or eleven, as the holder may elect.

Vinland ('Wineland') is the name given to the territory discovered by the Norsemen at the beginning of the 11th century on the mainland of North America, but modern scholars disagree as to the exact location. Rafn placed it in Rhode Island, Daydon Jackson in northern New Brunswick, Storm, Nansen, and Babcock in Nova Scotia, Horsford and Hovgaard in Massachusetts. The only two sagas, contained in *Hauk's Book* and in the *Flatey Book* respectively, which give detailed accounts, differ on many points, but it is now fairly generally conceded that the *Saga of Eric the Red* (in *Hauk's Book*), dating from the end of the 13th century (about a century earlier than the other account), is the more reliable. The general story would appear to be as follows. In 986 A.D. Bjarni Herjulfson, when making a voyage from Iceland to Greenland (of which country his father, Herjulf, and Eric the Red were the earliest colonists) was driven by a storm out of his course to the south, sighted Vinland (but did not land), and eventually reached his destination by way of Labrador or Baffin Land. In 1000 Leif the Lucky, son of Eric the Red, coming from Iceland,

landed in Vinland, where he found *vínber*, 'self-sown wheat,' and *masur* wood, and then continued to Greenland. In 1002 Leif started out from Greenland on a voyage of exploration, sailed by way of Baffin Land or Labrador, and spent the winter at Vinland, calling his settlement Leifsbooths. Two years later his brother Thorvald led an expedition to Vinland, but was killed in an encounter with the natives, who appear for the first time in the accounts, and are called *Skraelings*. In 1007 Karlsefni, an Icelander, who had married Gudrid, widow of Thorstein, another son of Eric the Red, sailed from Greenland with 160 men, made some attempt at colonisation, but gave it up after three years, after which nothing more was done. It must be remembered that the term 'Vinland' need not cover the identical piece of land connected with each expedition (except perhaps with the visits of 1002 and 1004, on the latter occasion of which special care was taken). Vinland, however, is always represented as being south of Markland ('Woodland'), probably either Newfoundland or S. Labrador, and Markland as being south of Helluland ('Stoneland'), probably either N. Labrador or Baffin Land. *Vínber*, 'self-sown wheat,' and *masur* present difficulties. The word Vinland is undoubtedly derived from *vín* (wine), and *vínber* in Old Norse means grape; but while some authorities class *vínber* as *Vitis vulpina* or *V. Labrusca*, others (including Fernald) contend that the word was used generically for some kind of berry, cranberry or other. It is doubtful whether wild grapes have ever been found on the Atlantic coast further north than the southern portion of New Brunswick. Self-sown (or newly sown) wheat has been variously determined as Indian corn, wild rice (*Zizinia aquatica*), or some kind of wheat-like grass, but *masur* wood was probably that of the birch. As to the *Skraelings*, opinion leans rather to the idea that they were Indians, not Eskimos. Nansen admits that the Norsemen did land in America, but maintains that the sagas in their details were coloured by Irish tradition of voyages to the fabulous Isles of the Blest. Finn Magnusen laboured to prove that Columbus visited Iceland in 1477, and derived his first hints of a new world from the accounts of these old Icelandic expeditions. A statue of Leif Ericsson stands near Boston, Mass.

See GREENLAND, ICELAND, NORTHMEN, and the books there cited; also Rafn, *Antiquitates Americanæ* (1837); Storm, *Studies on the Vineland Voyages* (1888); Reeves, *The Finding of Wineland* (1890); Horsford, *Problem of the Northmen* (1890); Fiske, *Discovery of America* (1892); Fernald, *Notes on the Plants of Wineland* (*Rhodora*, 1910); Gathorne-Hardy, *The Norse Discoveries of America* (1921); Nansen, *In Northern Mists* (1911); works on Vinland in Swed. by Svensén (1899), in Norweg. by Jónsson (1911); books on the Norsemen in America by Fisher (1903), Babcock (1913), and Hovgaard (1915).

Vinnitsa, a town of Ukraine, in Podolia, stands on the Bug, 120 miles SW. of Kieff; pop. 51,000.

Vinogradoff, SIR PAUL GAVRILOVICH (1854–1925), Anglo-Russian jurist, was born at Kostroma on the Volga, and studied at Moscow University, where he became professor of history, resigning his chair in 1902, when he settled in England, a country he had visited previously. In 1903 he was appointed Corpus professor of jurisprudence at Oxford, and in 1917 was knighted. A remarkable linguist, he published *Villainage in England* (1892), *Growth of the Manor* (1905), *English Society in the Eleventh Century* (1908), edited *Oxford Studies in Social and Legal History* (1909–21), and wrote extensively on Russia. Vinogradoff's researches into Anglo-Saxon and Norman history and law were especially brilliant, elucidating finally many points of controversy regarding the position of the villein, the manor, &c. See Monograph by Holdsworth (1926).

Viol (Ital. *viola;* Late Lat. *vitula*, from *vitulari*, 'to celebrate a festival': *fiddle* is a doublet), the name given generally to an important family of stringed and bowed instruments that flourished from the 15th century to the 17th, when the violin was perfected. Small fiddles are to be seen represented on monuments as far back as the close of the 11th century. The back of the viol was flat; there were larger bends in the sides than in the violin, and sloping shoulders; and frets, like those of the guitar, were sometimes placed on the neck of the instrument, to show where the fingers of the left hand should be put to produce the desired notes. The strings were 5, 6, or 7 in number, and were tuned by fourths and thirds. There were four sizes of viol in use, *treble* or *discant*, *tenor* or *viola da braccio*, *bass* or *viol da gamba*, and *double bass* or *violone*, and they were often played together in concerted music. Their tone was rather penetrating than powerful. The treble viol was rather larger than the modern violin, and, like the viola da braccio, was played against the arm. The viol da gamba, played between the knees, held its place longer than the smaller viols, but was superseded by the violoncello. The Double Bass (q.v.) has survived in the orchestra of to-day, retaining many viol characteristics. The *viol d'amore* was a tenor viol, with from seven to fourteen sympathetic metal strings, stretched under the fingerboard, tuned to a scale. Carl Zoeller (1840–89) made great efforts to popularise the viol d'amore, and wrote a tutor for it. A 'chest of viols,' consisting of six instruments of various sizes, was in the 16th and 17th centuries to be found in most houses of any pretension in England. See VIOLIN.

Viola (Ger. *Bratsche;* Fr. *Alto*), also called ALTO VIOLA, or TENOR VIOLIN, a larger description of violin, has four gut strings, the two lower covered with silvered copper wire. It is tuned in fifths, the first or upper string sounding A on the second space of the treble clef, and the others the D, G, and C successively below. The compass is from the latter note to about C on the second leger-line above the treble clef, though a few notes higher are taken by soloists, and the music is written on the alto clef, or on the G clef if high. The viola is in size about one-seventh larger than the violin. Theoretically it ought to be larger to correspond with its pitch, but in that case it would be extremely awkward, if not impossible, to play, either against the arm or between the knees. A compromise has been reached, which makes the tone veiled and muffled—a characteristic which Wagner tried to remedy. The viola is a member of the modern string quartet, but as an independent part in orchestral and chamber music came of importance only about the time of Mozart. Paganini sometimes played the viola. See VIOL, VIOLIN.

Viola. See VIOLET.

Violaceæ, a family of dicotyledonous plants, running to nearly a thousand species, natives both of temperate and tropical countries, those belonging to the former being generally herbaceous, and those belonging to the latter generally shrubby. They have simple leaves with persistent stipules. The calyx consists of five persistent sepals, usually elongated at the base; the corolla of five hypogynous petals. There are five stamens inserted in a hypogynous disk, the filaments prolonged beyond the anthers. The ovary is one-celled, generally with many ovules, the style single, with an oblique stigma. The fruit is a three-valved capsule, with many seeds. The best-known species are the violets. Emetic and

purgative properties prevail in the family, and some of the South American species yield valuable medicine, as White Ipecacuanha (*Ionidium Ipecacuanha*). The leaves of the Loboloba (*Alsodeia physiphora*) are used in Brazil as spinach.

Violet (*Viola*), a genus of herbaceous plants, mostly perennial, of the family Violaceæ. They have a short stem, or are stemless, having in the latter case a short root-stock (rhizome); the leaves are alternate, and have long stalks; the flowers have five petals, different in form and size, the lowest having a spur behind. Some hundreds of species have been described, natives chiefly of northern temperate countries. Several species are much cultivated in gardens, some, as *V. tricolor*, on account of their beautiful flowers; others, as *V. odorata*, on account of their fragrance. *V. tricolor*, the Pansy, Pansy Violet, or Heart's Ease, is very abundant in fields, meadows, woods, &c. in Britain and in most parts of Europe, and the north of Asia; it is also found in North America, although it has probably been introduced there from the Old World. It is a very variable plant, its flowers differing much in size and colour, but is readily distinguished by its large lyrato-pinnatifid stipules. The stem is somewhat triangular, branching, and diffused. In

Flowers of *a*, Sweet Violet (*Viola odorata*); *b*, Fancy Pansy (*V. tricolor*); and *c*, Bedding Viola (*V. cornuta*).

some of its most common forms this plant is a mere despised weed, with small flowers; other wild forms have much larger flowers; and to it are referred the large and beautiful garden pansies, the varieties of which are innumerable. The Pansy (Fr. *pensée*, probably from the drooping attitude of the flower, suggestive of thoughtfulness) is one of the finest of florists' flowers, and no flower has been more improved by cultivation. There are two classes or types of pansy, the Show Pansy, in which the colours are either white, yellow, or purple, alone or in combination, and the Fancy, in which crimson or maroon is added to the other colours and the flowers are beautifully blotched or shaded, having a clear margin of the ground colour surrounding them, as shown at *b* in the illustration. At *c* is shown one of the original parents of the popular Bedding Violas, the varieties of which are very numerous. By intercrossing with the pansy and other showy species greater variety and brightness of colour prevails now than formerly when purple was the principal tint. Another species has of late years been introduced into cultivation, *V. altaica*, a native of Siberia, and by itself, or by hybridisation with *V. tricolor*, has become the parent of many garden pansies. The finest garden pansies are not preserved or propagated without great difficulty, and require most careful cultivation, without which they quickly relapse to their wild forms. Florists demand that a pansy shall have a round, flat, and very smooth edge, the petals thick and velvety, the three front petals alike in their ground colour, the lines or pencillings in the centre bright and distinct, the two back petals—which always differ in colour from the others—perfectly uniform, the flower measuring at least an inch and a half across. The Sweet-scented Violet (*V. odorata*) is common in grassy places in England and throughout Europe and the north of Asia. The flowers are either of a deep blue colour or more rarely white. Several other species, with pale blue flowers, and destitute of smell, are common in meadows and woody glades in Britain and other parts of Europe. The Dog Violet (*V. canina*) is one of the most common ornaments of hedgebanks. North America has a number of species, one of which, *V. blanda*, is sweet scented. The Himalayas produce a number of species very similar to those of Europe. The roots of several species of violets were formerly used in medicine. They contain a bitter alkaloid, *Violine*, which acts as an emetic and purgative. The petals of the sweet-scented violets are used for the preparation of *Juice* or *Syrup of Violets*, which is used as a gentle purgative for children, and also as a chemical test, being reddened by acids, and rendered green by alkalies. See Mrs Gregory, *British Violets* (1912).—For the Dog-tooth Violet, Dame's Violet, and Water-Violet, which have no connection with this genus, see separate articles. The so-called Usambara Violet is one of the Gesneraceæ (*Saintpaulia ionanthe*). —The so-called Violet-powder, used for purposes of the toilet and nursery, is very fine starch perfumed with orris-root or other perfume.

Violet Stones, stones found upon certain mountains, as on the Brocken and the Riesengebirge, which, in consequence of being covered with so-called Violet Moss, emit a smell like that of violets. Violet Moss, really an alga (*Trentepohlia iolithus*), consists of simple articulated threads, and spreads over the stones in the form of a delicate incrustation.

Violin (diminutive from *viol*), the smallest but most important of the stringed musical instruments played with the bow. It is the treble member of the family, which includes the Viola (q.v.) and the Violoncello (q.v.), but not the Double Bass (q.v.). It consists of a wooden sonorous chest, formed of two slightly arched surfaces, known as the back and belly, united by sides or ribs, with a curve or hollow on each side in the middle of the length, and corner-blocks glued inside the joins between the curves and sides; a neck and finger-board attached to the chest; and strings, fastened at one end to the belly by a tailpiece or projection of wood, and at the other to tuning-pegs at the head or extremity of the neck, by which they can be tightened or loosened at pleasure. The strings thus passing over the belly are raised up from it by a bridge, which is supported in the interior by the sound-post, while the bass-bar or sound-bar is fastened obliquely to the belly under the left foot of the bridge; and on the belly there are two sound-holes opposite each other, of a form resembling the letter *f*, or long *f*. The edges of the belly and back are preserved from chipping by thin inlays of hard wood, known as purflings. Pine wood is used for the belly, maple for the back, and ebony for the finger-board, while the whole is specially varnished. Only glue is used for the joining of the wooden parts. The sounds are produced by drawing a bow across the strings, the upper surface of the bridge being convexly curved, so as to enable the bow to be drawn along each string separately, without coming in contact with the rest. The modern violin has four strings of gut, the lowest covered with fine silvered copper wire, or sometimes, in the best instruments, with silver or even gold wire; but the highest string is frequently now made of steel wire instead of gut. These strings are tuned in fifths, the highest or first string sounding E on the fourth space of the treble clef, and the others A, D, and G in succession below. The bow, of brazil-wood and horsehair, is held in the right hand, and the sounds of each string, other than the

open notes, are obtained by stopping—i.e. pressing it with the finger against the fingerboard at certain distances, thus shortening the vibrating portion, and raising the pitch of the sound. Very high notes are produced by the Harmonics (q.v.) of the string, which, instead of being pressed against the fingerboard, is touched lightly, the sound being due not, as in ordinary cases, to the vibration of the part of the string between the point of stopping and the bridge, but to that of a harmonic section of it. A peculiar modification of tone is produced by the application of the *mute* or *sordino*, a little instrument placed on the bridge. A violin or other bow-instrument can be played *pizzicato*—i.e. with the fingers, as a harp or guitar. The compass of the violin is about three octaves and a half, from G below the treble clef to C above the fifth leger-line above it, with all the intermediate chromatic intervals; but the highest notes are apt to be harsh and squeaking. Great players command a few notes higher, chiefly by harmonics. Though chiefly an instrument of melody, it is to a limited extent capable of harmony by double stops—two notes may be struck together, and three or four notes may be played in arpeggio. No instrument can compare with the violin in power of expression and execution. It has an unlimited command over a very wide range of sounds, to which any degree of piano and forte, of staccato and legato, can be imparted. In orchestral music there are always two different violin parts known as first and second violin (see ORCHESTRA); and the same is generally the case when the violin is used in concerted music, the usual arrangement of stringed quartet music being for two violins, viola, and violoncello.

The origin of the violin has been traced to the one-stringed ravanastron, the simplest of the oriental stringed instruments played with a bow, which is traditionally the invention of Ravena, a mythical king of Ceylon, and is still played by Buddhist begging monks. The urheen of China and the rebab of Persia and Arabia were also played with bows, but stringed instruments of the Greeks and Romans were all plucked. Adequate evidence, however, connecting Asiatic with European fiddles is wanting, but by the 9th century there existed in South Europe the rebec (descended, perhaps, from the rebab), a pear-shaped instrument with bulging sides, and by the 11th century, in North Europe, the fiedel, resembling a guitar in shape. It is certain that the Welsh crwth was originally derived from the lyre, and only later played with a bow. The bow has not been conclusively accounted for, being variously supposed to have been primarily a military bow, a plectrum, and a second monochord lute applied to the first. The geige resembled the rebec, while the jongleur, troubadour, and minnesinger popularised the guitar fiddle, a larger version of the fiedel, but all these early instruments were small, and played against the arm. The use of instrumental music synchronised with the improvement in the instruments themselves; and in the 14th century the application of corner-blocks, waists, and sound-holes led to the creation of the viol family (see VIOL), and in the 16th century there developed from the viols the violin, viola, and violoncello. The Tirolese Gaspar Duiffoprugcar (*c.* 1514–*c.* 1570) is sometimes credited with the creation of the earliest violin, but the honour more properly belongs to Gasparo da Salò (1542–*c.*1610), who worked in Brescia, and had Maggini as a pupil. The family of the Amati (q.v.) at Cremona, founded by Andrea (*c.* 1520–*c.* 1580) and culminating in his grandson Niccolò (1596–1684), produced violins whose tone and quality have been the wonder of succeeding times. But even a higher level of brilliance and richness was reached by Antonio Stradivari (1644–1737), also of Cremona, and pupil of Niccolò, and for a time the repute of Cremona was kept up by the families of the Ruggeri and the Guarneri, culminating in Guiseppe Guarneri del Gesù (1687–*c.* 1745). Next to the old Italian violins, in the estimation of connoisseurs, stand those of the Tirolese makers, Jakob Stainer (1621–83) and the Klotz family. Names of modern makers worth mentioning are those of the Frenchmen Lupôt and Vuillaume (1798–1875), and of the Englishmen, W. Forster (1713–1801), Duke, Banks, Ebsworth Hill (1817–95), and Vincent. In all essentials the violin has not changed since the days of the Amati, but the modern bow perfected by Tourte only dates from the end of the 18th century. Experience has shown that the most minute details of form and proportion, and the material of which each separate part is made, are matters of vital importance to the quality of the violin. The great makers seem by a succession of delicate experiments and observations to have attained to acoustical qualities of high perfection, which their careful workmanship and extreme dexterity enabled them in all cases unfailingly to produce. For a fine example of a Stradivari, prices of £2000 or over are now by no means uncommon. The cost of the raw materials of a violin, comprising 70 different parts, has been estimated at a few shillings. The founder of artistic violin-playing was Corelli (1653–1713), while famous violinists have been Tartini (1692–1770), Pugnani (1727–1803), Viotti (1753–1824), Paganini (1784–1840), Spohr (1784–1859), Vieuxtemps (1820–81), Joachim (1831–1907), H. Wieniawski (1835–80), Sarasate (1844–1908), Ysaye (*b.* 1858), Kreisler (*b.* 1875), Thibaud (*b.* 1880).

See the various standard histories of music and biographies of famous violin makers and players; Vidal, *Les Instruments à Archet* (3 vols. 1876–78); Engel, *Researches into Early History of Violin Family* (1883); Heron-Allen, *Violin-making* (1884–1900); Hart, *Violin: its Famous Makers* (1887); Broadhouse, *Violin: its Construction* (1892); Haweis, *Old Violins* (1898); Morris, *British Violin Makers* (1904); Stoeving, *Story of the Violin* (1904); also article in Grove's *Dictionary*.

Viollet-le-Duc, EUGÈNE, architect, was born in Paris, 24th January 1814, and studied with especial care the ancient monuments of Provence, Italy, and Greece. In 1840 he was director of the restoration of the Sainte Chapelle, and from this time on was the great 'restorer' of ancient buildings in France, both secular and ecclesiastical; displaying unquestioned zeal and learning, but, from the point of view of those who suspect wholesale 'restorations,' a lack of piety for the actually old. He served as an engineer in the defence of Paris, and was a prominent advanced republican politician till his death, 17th September 1879.

Of his numerous works the best known was his great dictionary of French Architecture (1853–69). There have been translated into English works on military architecture, how to build a house, the annals of a fortress, the habitations of man in all ages, on restoration, and a volume on Mont Blanc. See monographs by Sauvageot (1880), Saint-Paul (1881), and Gout (1914).

Violoncello (diminutive from Ital. *violone*, 'large viol or double bass'), a large instrument of the violin class, held by the performer between his knees. It has four gut strings, the two lower of them covered with silvered copper wire, and is tuned in fifths, the first or upper string sounding A on the fifth line of the bass clef, and the others the D, G, and C successively below. Its compass is from the latter note up to about C on the third space of the treble clef, but soloists play some notes higher. Its signature is usually the bass clef, the tenor or treble clef being used for the higher notes. The violoncello is a member of the

modern string quartet, and apart from its invaluable use as a bass in orchestral music, it is remarkable for a rich singing tone, especially of the two upper strings, and a wide range of expression, comparable to that of the violin. The violoncello definitely superseded the viol da gamba in the first half of the 18th century, and instruments by the Amati, Stradivari, the Guarneri, the Ruggeri, &c., all command high prices. Prominent violoncellists have been Servais (1807–66), Piatti (1822–1901), Popper (1843–1913), and Casals (*b.* 1876). See VIOL, VIOLIN; van der Straeten, *History of the Violoncello and Viol da Gamba* (1915).

Vionville, a small village of Lorraine, 20 miles W. of Metz, famous for the great cavalry battle (sometimes named from the adjoining village of Mars-la-Tour) of 16th August 1870, when the French were driven back on Metz.

Viotti, GIOVANNI BATTISTA (1753–1824), violinist and composer, born in Piedmont, studied in Turin, and in 1780 played in Germany, France, England, and Russia with éclat. He settled in Paris, but in 1795–1815 was in London, where, after another sojourn in Paris, he died. He composed concertos, sonatas, string quartets, and influenced musical taste by his own admirable playing and by his teaching.

Viper (*Vipera*), a genus of venomous snakes, including the Adder (*V. berus*), the Asp (*V. aspis*) of southern and western Europe, the Daboia or Russell's Viper (*V. russelli*) one of the scourges of India. Nearly related genera are represented by the Horned Viper (*Cerastes cornutus*) of NE. Africa and Palestine, and the Puff-adder (*Bitis arietans*) likewise African. The vipers (Viperinæ) are restricted to the Old World, while the pit-vipers (Crotalinæ), with a pit between the eye and the nose, occur in N. and S. America (Rattlesnakes) and in the southern half of Asia. These two subfamilies make up the family Viperidæ. True vipers are marked by a relatively broad head, a highly developed fang on each maxilla, and virulent poison. All but the African Atractaspis are viviparous.

Common Viper or Adder (*Vipera* or *Pelias berus*).

The common viper or adder is the only poisonous snake indigenous to Britain. It lives especially on dry heaths and waste places, often among stones and brushwood; it is commoner in Scotland than in England, and does not occur in Ireland. It is widely distributed throughout Europe. Often confused with the innocent Grass-snake (*Tropidonotus natrix*), it may be distinguished by its markings. It has two diverging marks between and rather behind the eyes, a spot on each side of the hinder part of the head, a row of confluent rhomboidal spots running zigzag along the upper surface the whole length of the body and tail, and a row of small irregular, almost black, triangular spots on each side. The under parts are of a lead colour. The characteristic markings are almost invariable; but the ground colour varies considerably, from nearly olive, rich deep brown, or brownish yellow, to almost black. Thus in some parts of England a 'Black Viper' is occasionally met with; its ground colour a rich black, and the markings of a more intense black than the rest. There are also the 'red' and the 'blue-bellied,' and an almost white viper, with black markings. The viper seldom exceeds two feet in length. It feeds on mice, frogs, small birds, and other small animals, which are killed by its poison-fangs, and swallowed entire. It hibernates during several months of the year, and several may then be found twined together in a torpid state. It is a good swimmer, and may occasionally be seen on lakes such as Loch Lomond, crossing from one island to another. The young are produced in early summer, from ten to fifteen or more at a birth. The eggs have soft, thin envelopes, and are hatched within the oviduct. The young viper is coiled up so closely in the egg as to appear almost a solid mass, but the moment it is set free it is active, and ready to throw itself into an attitude of defence.

Young Viper's Position in the Egg.

It has often been alleged that in times of danger the young of the viper seek refuge in their mother's open mouth, and find temporary protection in her œsophagus; but, although this unlikely habit is not impossible, the fact is not supported by sufficient evidence. The viper is naturally shy of man, but when trod on or provoked is of course ready to defend itself by biting. The bite is painful, and, though not dangerous to healthy adults, is apt to be attended with more serious consequences in the case of children or those of weak constitution. Fatal cases are exceedingly rare. For remedies, see SNAKES; and for the proverbial deafness of the adder, see SNAKES.

The name Viper (Lat. *Vipera*) is manifestly a contraction of *Vivipera* for *Vivipara*. The name Adder arose from writing *an adder* for *a nadder*. The O.E. is *nædre*, Mid. Eng. *naddere*, *neddere*, or *addere*, Scot. *nether*, *ether*. Pliny, Galen, and other ancient writers ascribe great medicinal virtues to broth made of vipers, and to the flesh of the animal. Vipers twined together in hibernation were supposed to produce the *Ovum Anguineum*, to which virtues were attributed; and *Snakestones* as charms were at one time common in Britain. They were either marbles or glass beads of various forms, supposed to cure vipers' bites, and to be otherwise useful.

Viper's Bugloss (*Echium vulgare*).

Viper's Bugloss (*Echium*), a genus of plants of the family Boraginaceæ, having a calyx with five deep segments, an almost bell-shaped corolla, with dilated throat, and irregular limb, very long unequal filaments, and a bifid style. The species are large herbaceous plants or shrubs, rough with

tubercles and hairs. Their flowers are often very beautiful. The Common Viper's Bugloss (*E. vulgare*), a large annual plant, is a native of Britain and of most parts of Europe, growing in dry places, not unfrequently in cornfields. Its flowers are at first reddish, and afterwards blue. The property of healing vipers' bites was anciently ascribed to it. The various species are widely distributed.

Virbius, a deity worshipped at Nemi (q.v.), probably Diana's lover, perhaps a local Jupiter. See Frazer's *Golden Bough*.

Virchow, RUDOLF, pathologist and publicist, was born 13th October 1821 at Schivelbein in Pomerania, studied at Berlin, and in 1843 became prosector at the Charité there. In 1847 appointed a university lecturer, next year in the revolutionary fervour he got into disfavour, and was invited in 1849 to Würzburg as professor, but in 1856 returned to Berlin as professor and director of the pathological institute. He founded, edited, and contributed to several important medical journals, took part in numerous commissions, and speedily became one of the foremost pathologists in Europe, making very important contributions to many departments of pathological and physiological science. He rendered important services to archæology and anthropology in connection with such subjects as lake-dwellings and cave-men, skulls from Trojan graves and Egyptian tombs; and as a politician has long been one of the most influential leaders of the advanced liberals of Prussia, where in 1862 he was first elected a member of the Prussian chamber. Of his innumerable works on medical and anthropological science *Cellular Pathology as based on Histology* (1850; 4th ed. 1871; Eng. trans. 1860) is the most famous. Others are *Famine Fever* (trans. 1868), *Freedom of Science* (trans. 1878), *Infectious Diseases in the Army* (1879), *Post-mortem Examinations* (trans. 1878), and treatises on trichiniasis, hygiene and sewerage, barracks, &c. He exercised enormous influence in the improvement of asylums and hospitals. His 80th birthday was celebrated with enthusiasm in 1901; and he died 6th September 1902. See Lives in German by Becher (1894) and Ebstein (1903).

Vire, an ancient and picturesque town of Calvados, Normandy, on a rock by the Vire, 35 miles SW. of Caen, and surrounded by hills and the beautiful valleys known as Vaux de Vire (see VAUDEVILLE). There is a trade in country produce. Pop. 6000.

Virgil, POLYDORE. See VERGIL.

Virgil (Publius Vergilius Maro), the prince of Latin poets and one of the three or four chief poets of the world, was born at Andes near Mantua on the 15th of October 70 B.C. The plain of Lombardy then lay beyond the political boundary of Italy proper, and formed a province known as Cisalpine Gaul. The population was mainly Celtic, but was already permeated by the Latin language and civilisation; and Julius Cæsar, when he admitted it to full Roman citizenship in Virgil's twenty-first year, was adjusting rather than extending the natural limits of Italy. The names Vergilius and Maro are possibly both Celtic, and in the poet's conjectured Celtic blood some modern critics have sought the origin of his romantic and melancholy temper, and of the deep sense of natural beauty and the spiritual meaning of nature, in which he stands alone among Greek and Latin poets.

Virgil's father owned a small property in his native place, where, besides the ordinary work of a farm, he occupied himself in forestry and bee-keeping. He was well enough off to give his son the education which was generally confined to a wealthier class. The boy was sent to school at Cremona and Milan, and at the age of sixteen went to Rome and studied rhetoric and philosophy under the best teachers of the time. His studies were probably interrupted by the civil war; at all events, we know nothing of the next years of his life till 41 B.C. The victorious triumvirs were then providing for the immense armies which had been disbanded after the battle of Philippi by settling them on confiscated lands throughout Italy. Virgil's farm was part of the confiscated territory of Cremona; but his reputation as a rising poet had already brought him under the notice of the governor of the district, Asinius Pollio, himself a distinguished man of letters. By Pollio's advice he went to Rome, with special recommendations to Octavianus; and though his own property was ultimately not restored to him, he obtained ample compensation from other sources, and soon became one of the circle of endowed court-poets who gathered round the prime-minister Mæcenas. In 37 B.C. the *Eclogues*, a collection of ten pastorals modelled on those of Theocritus, were published, and received with unexampled enthusiasm. Soon afterwards Virgil withdrew from Rome to Campania. The munificence of Mæcenas had placed him in easy and even affluent circumstances. He had a villa at Naples, and a country-house near Nola; and he seems to have lived almost entirely in this neighbourhood during the seven years in which he was engaged on the composition of the *Georgics*, or *Art of Husbandry*. This poem, which is in four books, and deals with tillage and pasturage, the cultivation of trees, especially the vine and olive, and the breeding of horses, cattle, and bees, appeared in 30 B.C., and confirmed Virgil's position as the foremost poet of the age. The remaining eleven years of his life were devoted to a larger task, which had been the ambition of his youth, and was now resumed at the urgent request of the emperor, the composition of a great national epic. During these years he lived a secluded life, chiefly in Campania and Sicily; he seems also to have travelled in Greece, and to have paid occasional visits to Rome, where he had a house in the fashionable quarter on the Esquiline. The subject he chose was the story of Aeneas the Trojan, the legendary founder of the Roman nation and of the Julian family, from the fall of Troy to his arrival in Italy, his wars and alliances with the native Italian races, and his final establishment in his new kingdom. By 19 B.C. the *Aeneid* was practically completed, but Virgil had set apart three years more for its final revision. In the summer of that year he left Italy with the intention of travelling in Greece and Asia; but at Athens he fell ill, and returned only to die at Brundisium a few days after landing, on the 21st of September. He had almost completed his fifty-first year. In his last illness he left directions to his executors that the unfinished *Aeneid* should be destroyed. By the command of Augustus these directions were disobeyed, and it was published as we now possess it. At his own wish he was buried at Naples, on the road to Pozzuoli, his tomb for many hundreds of years after being worshipped as a sacred place.

In person Virgil was tall and dark, shy and silent in manner, and suffering from delicate health throughout his life. The only portrait of him which can claim to be authentic is in a mosaic discovered in 1896 at Sousse in Tunisia. Though executed more than a century after Virgil's death, this mosaic is clearly copied from a picture, which may have been painted much earlier, at a time when many portraits of him undoubtedly existed. He never married, and from his will it would appear that a half-brother was the only near relation whom he left. His sincerity and sweetness of

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temper won the affectionate praise of Horace, who is not lavish of praise.

Besides the three works already mentioned, a few juvenile pieces of more or less probable authenticity are extant under his name. These are the *Culex* and the *Moretum*, both in hexameter verse, the former an 'epyllion,' or short poem of narrative and description in the epic manner, the latter an idyll freely translated from the Greek of Parthenius; the *Copa*, a short elegiac piece; and fourteen little poems in various metres, which come under his name in a collection of minor Latin poetry incorporated in the Latin Anthology. These pieces are not printed in most editions of Virgil, nor are any of them certainly authentic, though some of them passed as his among scholars within a century after his death. The *Ciris*, a piece of the same kind as the *Culex*, is now generally accepted as being in the main the work of his friend and fellow-student, Cornelius Gallus.

The supremacy of Virgil in Latin poetry was immediate and almost unquestioned. The enthusiasm excited by the *Eclogues* rose partly from the recognition in them of a new sense of romantic beauty, partly from the feeling that a Roman artist had at last appeared who could be set beside the great artists of Greece. In the hands of Lucretius and Catullus the intractable Latin tongue had proved able to express impassioned argument and vivid emotion; in the *Eclogues* it assumed a richness, harmony, and sweetness till then quite unknown. The promise shown in the *Eclogues* was more than fulfilled in the *Georgics*. In no work of ancient or modern art is there a more sustained splendour, an ampler music of language, a more magical fusion of thought and feeling. The workmanship of the *Æneid* is more unequal; but in its great passages there is the same beauty, with an even fuller strength and range. Virgil left the Latin language to his successors as an instrument of which he had sounded the full compass and developed the entire capacity; subsequent Latin poetry has to be estimated by the degree in which it falls short of his. There were some in ancient as in modern times who continued to prefer the direct force and austere simplicity of Lucretius, or even the rough-hewn verse of Ennius, to Virgil's rich and intricate harmonies; but for the world Virgil was the imperial poet, the great voice of Rome.

In estimating Virgil's place among the great poets of the world different natures will lay stress on different qualities as constituting the essence of the highest poetry. Virgil is not comparable to Homer in dramatic force and in the fresh charm of his story; he has not the concentrated passion of Pindar or Dante; and the lyrical cry of direct emotion, such as thrills us in Sappho or Catullus, belongs to a different order of art from the majestic sadness, the serene and harmonious cadences, of poetry enriched with all the associations of art and learning, and wrought by patient labour into the most exquisite finish. But what Virgil has in a degree that no other poet has ever equalled is pity; the sense of 'tears in things,' to which in the most famous of his single verses (*Aen.* i. 462) he has given imperishable expression, and which fills with strange insight and profound emotion those lonely words and pathetic half-lines where he has sounded the depths of beauty and sorrow, of patience and magnanimity, of honour in life and hope beyond death.

The reputation of Virgil from his own time till now is probably unparalleled in its continuity. His works were established classics even in his lifetime, and soon after his death had become, as they still remain, the school-books of western Europe. By the 3d century his poems ranked as sacred books, and were regularly used for purposes of divination. The purity and piety in which he is eminent beyond other Latin poets, together with the mystical interpretation of the fourth *Eclogue*, which found in him an unconscious channel of divine inspiration and a 'prophet of Christ among the Gentiles,' made his fame almost as high in the Christian as in the pagan world; of all the testimonies borne to his matchless power in stirring the deepest human emotions the subtlest and most eloquent are those of two princes of the Catholic Church nearly fifteen centuries apart from one another—Augustine and Newman. In the dark ages his fabled powers as a magician almost eclipsed his real fame as a poet; but with the revival of learning he resumed his old place; for Dante and Petrarch, and for the whole of the earlier and later Renaissance, he was the first of the world's poets. In the earlier part of the 19th century his reputation for the first time suffered serious eclipse. The spiritual upheaval of the age which followed the French Revolution turned for inspiration to other sources; and in the general anarchy of taste which followed Virgil fell out of fashion among readers too capricious or too impatient to feel his charm. Criticism has now returned to a juster view, and the most recent estimates of Virgil, both in France and England, are also the most appreciative, not only of his immense learning and of the wonderful truth and refinement of his descriptions, but of his eminence in all the essential qualities of poetry. Of his consummate mastery of metre and diction there has never been any question; even those who have thought least of his dramatic power or imaginative insight have acknowledged the finished beauty of his language, and the stately and haunting music of his verse, to which the noblest of tributes has been given by Tennyson, himself the most Virgilian of modern poets.

There are extant MSS. of Virgil of as early a date as the 4th century. The *editio princeps* was printed at Rome by Sweynheym and Pannartz in or before 1469. Of the countless subsequent editions the most important historically are those of La Cerda (1608–17), Heyne (1767–75; enlarged in subsequent editions and afterwards re-edited by Wagner), and Ribbeck (1859–68). There is no standard English edition subsequent to that of Conington and Nettleship (revised 1883–84), which is in many respects obsolete. Among the best is that by T. E. Page; mention may also be made of those by Goelzer and Bellessort (French), Ladewig-Schaper-Deuticke (German), and Sabbadini (Italian). There are many translations, of which Dryden's and Rhoades's in verse, and J. W. Mackail's in prose, are perhaps the best. In the immense and continually growing mass of Virgilian studies, special mention may be made of W. Y. Sellar's *Virgil*, Sainte-Beuve's *Étude sur Virgile*, F. W. H. Myers's 'Virgil' in his volume of *Classical Essays*, Warde Fowler's three volumes in the series of Virgilian essays published by B. H. Blackwell, Oxford, and J. W. Mackail's *Virgil and His Meaning to the Modern World*. *Virgil's Epische Technik*, by R. Heinze, is indispensable for appreciation of the *Aeneid*. The Latin spelling of the poet's name was, according to the evidence of inscriptions and of the best MSS., Vergilius, not Virgilius. The latter form was, however, also current, and established itself in common usage from the 5th century onwards. In spite of the protests of Politian and other scholars of the Renaissance, this usage continued; and while some scholars prefer to write of Vergil, Virgil is the name in common use throughout the modern world.

VIRGIL THE MAGICIAN.—Not the least remarkable circumstance in the history of Virgil is the reputation of the magician which the mediæval imagination persistently associated with his name. His undisputed supremacy and the peculiar fascination of his poetry made easy the notion of a wisdom and mystic meaning wrapped up in his verses, and as early as the 3d and 4th

centuries we find Christian authors like Minucius Felix, Lactantius, and Augustine separating him from all other pagan writers. Messianic prophecy was read into his fourth Eclogue, and Virgil and the Sibyl were actually introduced into the liturgy of the church, along with the Messianic prophecies of the Old Testament, as witnesses to a coming Messiah. Had not St Paul visited Virgil's tomb at Naples, and did not Statius owe his conversion to the fourth Eclogue? Centos were manufactured out of the *Æneid* giving the whole of sacred history in epitome. And already under the Roman empire it was customary enough to discover one's fortune by selecting lines at random from his epic—the famous *Sortes Virgilianæ* (q.v.). Ultimately in the *Divina Commedia* of Dante the 13th-century Virgil became a representative of enlightened reason, a gifted genius standing midway between paganism and Christianity. This deep half-religious veneration for Virgil, together with the scholastic conception of his superior wisdom, especially in mathematics and medicine, helps us to understand Dante's conception of the *vates sacer;* in the contemporary *Dolopathos*, a special version of the Seven Wise Masters (q.v.), we see the mythopœic process at work, the name of Virgil taking the place of the sage Sindibad.

It was out of Neapolitan folklore that the legendary reputation first grew, gaining many strange accretions from all sides on its course. But the earliest literary accounts were not Italian. The first writer to mention it is John of Salisbury in his *Polycraticon de Nugis Curialium et Vestigiis Philosophorum* (1156), who describes Virgil as making for Marcellus a fly that would destroy all other flies. But the first artistic treatment of the theme is seen in the letters of Conrad of Querfurt, afterwards Bishop of Hildesheim, the representative of the Emperor Henry VI. at Naples. He tells us he had seen the palladium of Naples (a model of the city enclosed in a narrow-necked bottle) and many other talismans and charms wrought by Virgil's skill—the most useful, the statue of an archer pointing an arrow at Vesuvius, which prevented its eruptions. These stories occur again with additions in Alexander Neckam's *De Naturis Rerum*, in the *Otia Imperialia* of Gervase of Tilbury, the French poem *Image du Monde* (1245), where the famous brazen head appears, as well as the first thread of love. In the rhymed *Weltbuch* of Johann Enenkel of Vienna (1250) we read how Virgil, finding the devil imprisoned in a glass bottle, released him after he had learned all his magic arts. His first task was the creation of a perfect woman. But not content with her he made love to a married woman of Rome who befooled him by a pretended assignation, and left him exposed to public ridicule hanging half up to her window in a basket. This last was an exceedingly popular mediæval story, and was even carved on the misereres of churches. In the *Roman de Cleomadés* of Adenés li Rois (*c.* 1290) we find the first mention of Virgil's figure holding the mirror at Rome which showed if treason was hatching anywhere—the famous *Salvacio Romæ*—as well as the copper statue of an archer whose arrow pointed at the public fire kept it alive; his magic garden we first meet in Padre Giordano's contemporary Life of San Guglielmo of Vercelli. The old stories again occur in the French romance of the *Renard Countrefait* (*c.* 1319); his compacts with the devil, with much detail, in the 14th-century German poems *Reinfrit von Braunschweig* and the *Wartburg-krieg*. The earliest attempt in Italy to weave all the varying legends into a collected form is the prose *Cronica di Partenope* of Bartolommeo Caracciolo (1382). In the *Process of the Seven Sages* (1330), the English form of the *History* thereof, the ninth tale is devoted to the 'nigramancie' of Virgil at Rome, and the same reappears in the *Gesta Romanorum* (No. 27). The latest stages of the legend may be seen in *Le Myreur des Histors*, written at Liége by Jean d'Outremeuse in the 14th century; the English *Lyfe of Virgilius* (1510; reprinted in W. J. Thoms's *Early English Prose Romances*); its French version, the *Faicts Merveilleux;* and in the Spanish *Romance of Virgilius* (1550). In the *Faicts* Virgil makes a statue the sight of which ensures the virtue of women. His own wife and other licentious Roman ladies try to break it, but in vain. He carries off the beautiful daughter of the Soldan of Babylon, baffles her father by sorcery, builds Naples, and establishes there a school of necromancy.

Comparetti thought these legends of popular and Neapolitan origin, but recognised in them two elements, the first exclusively Neapolitan connected with the notion of a special intimate affection of Virgil for the city; the second consisting of the distinct and not merely Neapolitan belief in certain public talismans attributed to Virgil, analogous accretions of legend being associated with most monuments of antiquity. J. S. Tunison, in his *Master Virgil* (Cincinnati, 1888), laboured to prove the legend originally of northern not southern origin, and of literary rather than popular genesis, the first writers who related tales of Virgilian magic being Norman Latinists of England and France.

See Zappert, *Virgil's Leben und Fortleben im Mittelalter* (Vienna, 1851); Roth in Pfeiffer's *Germania* (vol. iv. 1859); Milberg, *Mirabilia Vergiliana* (Meiss. 1867); Comparetti, *Virgilio nel Medio Evo* (2 vols. 1872; new ed. 1896; Eng. trans. 1895: see *Quarterly Review*, July 1875); and A. Graf, *Roma nella Memoria e nelle Imaginazioni del Medio Evo* (2 vols. 1882–83).

Virginal, or VIRGINALS. See HARPSICHORD.

Virginia, a middle Atlantic state of the American Union, named from the Virgin Queen Elizabeth, and once known as the Old Dominion. It is separated from Maryland by the Potomac and Chesapeake Bay, but includes part of the peninsula beyond the Bay; on the south it adjoins North Carolina and Tennessee; on the west and northwest are Kentucky and West Virginia. The greatest length from east to west is about 440 miles, and the greatest width from north to south 192 miles. It has a land area of 40,125 sq. m. and a water area of 2325 sq. m.

The surface of the state consists of a series of belts extending from north-east to south-west parallel to the trend of the coast on the east and the ranges of the Appalachian Mountains on the west. These divisions rise one above another from the coast westward, forming a stairway of ascending elevations. They differ in aspect, soil, climate, geological structure, and products. The tidewater region, penetrated by the waters of the ocean, of Chesapeake Bay and its inlets, and of the tributary streams, is divided into numerous peninsulas, and has a coast-line of nearly 1500 miles. The peninsula of the eastern shore and the Norfolk peninsula are low, rising but 20 or 30 feet above sea-level, and form the first in the series of ascending steps. The other peninsulas rise higher, forming the second and third terraces. Westward from the head of tidewater lies the middle country, an undulating plain from 25 to 100 miles wide, broken in places into ridges by outliers of the Appalachian Mountains and by the transverse valleys of the streams. The fifth ascent is the Piedmont plateau, having an elevation of from 300 to 500 feet, and diversified by numerous valleys and 'coves' formed by the broken coast-ranges and projecting spurs of the Blue Ridge. This eastern range of the Appalachians forms the next division, and for two-thirds

of its length within the state simply constitutes the divide between the Piedmont country and the Great Valley to the west. In the south-west it expands into a broad plateau, which, extending into North Carolina, forms the culminating portion of this mountain-system. The range consists of a series of domes connected by long ridges with many side spurs. The height of the mountains increases toward the south-west, as does that of the surrounding country. The Great Valley lies between the Blue Ridge and the western Kittatinny or North Mountains. Though this valley is continuous it has four watersheds and contains the minor valleys of the Shenandoah, the James, the Roanoke, the Kanawha, and the Holston or Tennessee rivers. The last of the belts belongs to the Appalachian mountain-region, and is styled 'Appalachia.' It may be described as a series of long narrow valleys 2000 feet or more above the sea, enclosed between the long parallel ranges of the Alleghany Mountains. About six-sevenths of the state is drained by the streams of the Atlantic system. The important rivers are the Potomac, Rappahannock, York, James, Blackwater, and Roanoke. The remaining seventh is drained mainly by the Kanawha or New River, the Holston, and the Clinch, which are tributary to the Ohio. Virginia is famous for the number and value of its mineral springs. The Natural Bridge, in Rockbridge county, and the many caverns, including Luray Cave, are among the objects of interest to tourists.

With its diversified surface and its position near the sea Virginia has a climate which varies with the locality. Except in the swampy portions of the tidewater district it is remarkably pleasant and healthy. The mean annual rainfall is from 40 to 45 inches, and is well distributed throughout the year. Along the shores of the tidewater region and in the marshes water-fowl of various kinds are abundant, and elsewhere partridges or quails, pigeons, grouse, wild turkeys, and other game birds are found. Deer are numerous in many sections. The fisheries are important, and large quantities of fish are shipped to other states. Oyster-culture is engaged in. The soils, especially those of the Great Valley, are very fertile, while there are valuable forests in the mountain region. Indian corn, wheat, potatoes, and oats are extensively grown, very high yields per acre being obtained. Early vegetables, strawberries, and apples are especially valuable on account of the facility with which they may be carried to the great Atlantic seaports. Tobacco has always been a staple crop in this state, and the 'Virginia leaf' is noted throughout the world for its excellence. Dairy-farming, cattle-rearing, and wool-growing are carried on. The mineral wealth of the state is considerable, there being found iron-ores in abundance, granites, limestones, marbles, and other building stones, gypsum, marl, lime, and clay products, &c., but coal (bituminous and anthracite) is the most important of all. The coal-field which occurs in the Triassic sandstones in the vicinity of Richmond yields, besides a bright, black, bituminous coal, a remarkable natural coke; but the most thoroughly worked coal area is the Pocahontas field in the south-west. There are important manufactures of cotton goods, tobacco, paper, lumber, leather, flour, machinery, &c. Water-power is plentiful, and facilities for transportation are excellent. Virginia sends two senators and ten representatives to Congress. The chief towns are the state capital, Richmond (pop. in 1920, 171,667), Norfolk (115,777), Portsmouth (54,387), and Roanoke (50,842). The state maintains an excellent system of public schools, and private schools, academies, and colleges are numerous. Among the more important institutions of higher learning are the William and Mary College (1693) in Williamsburg, the Washington and Lee University (1749) in Lexington, the Hampden-Sydney Presbyterian College (1776), the University of Virginia (1825) in Charlottesville, and the Military and Polytechnic Institutes.

The history of Virginia is perhaps more romantic and heroic than that of any other state of the Union. In 1584 the first English expedition landed on 'Roan Oke' Island (now in North Carolina), whereupon Elizabeth christened the country 'Virginia' and knighted Raleigh, who had organised the expedition, but had remained at home. In 1606 James I. granted a charter for the planting of colonies in Virginia, and the next year at Jamestown, on the James River (q.v.), there was founded the first lasting colony. In 1619 there was held at Jamestown the first representative Assembly in America. With this early period are associated the names of Captain John Smith (q.v.) and Pocahontas (q.v.). Such was the prosperity of the colony that at the end of the colonial period Virginia was the most populous and wealthy of the thirteen colonies. In the protest against the Stamp Act and the encroachments of Great Britain Virginia took the lead, and in the revolutionary struggle furnished such noted sons as Washington, Jefferson, Patrick Henry, the Lees, and Madison. At Yorktown the surrender of Cornwallis put an end to the contest. In the Civil War Virginia furnished the commander of the Confederate forces, General Robert E. Lee, and on its soil the last battle was fought, and the final surrender was made. At the beginning of the struggle the western part of the state seceded, and was admitted into the Union as West Virginia in 1863. Of the first twenty-one presidents of the country seven were natives of Virginia. Pop. (1800) 880,200; (1860) 1,596,318; (1880, after the separation of West Virginia) 1,512,565; (1900) 1,854,184; (1920) 2,309,187 (more than a quarter negroes).

See histories of Virginia by Stith (1865), Cooke (1884), Drake (1894); studies on 17th-century Virginia on Economics (1896) and Social Life (1907) by Bruce; Lancaster, *Historic Virginia Homes and Churches* (1915).

Virginia, UNIVERSITY OF, at Charlottesville, Albemarle county, Virginia, 4 miles from Monticello, the seat of Jefferson, by whom it was planned and organised. It was chartered by the state in 1819, opened in 1825, and has almost 2000 students and a library of 80,000 vols.

Virginia, WEST. See WEST VIRGINIA.

Virginia. See CLAUDIUS (APPIUS).

Virginia City, capital of Storey county, Nevada, is built, 6200 feet above the sea, on the eastern side of Mount Davidson, 16 miles NNE. of Carson. It owes its existence to its silver-mines, specially the Comstock Lode (q.v.), which began to give out in 1890. Pop. (1880) 10,917; (1920) 1200.

Virginia Creeper (*Vitis hederacea* or *Ampelopsis quinquefolia*), an American vine, known also (unhappily) as American Ivy, Woodbine, &c., often grown on the fronts of houses in Britain and continental Europe as an ornamental creeper. The tendrils terminate in a peculiar kind of sucker, and the autumnal foliage is rich in varied colour of light and dark green, brown, red, and yellow.

Virginian Deer. See CARIACOU.

Virginian Quail. See QUAIL.

Virginian Stock. See STOCK.

Virginia Water, an artificial lake, nearly 2 miles long, formed in 1746 by the Duke of Cumberland in the Great Park at Windsor, is 5 miles S. of the castle, and is mainly in Surrey, but partly in Berks.

Virgin Islands, a group in the West Indies, about 50 in number (though only a few are of any size or importance), lying between Porto Rico and the Leeward group of the Lesser Antilles. They were discovered by Columbus on his second voyage in 1494, and politically are divided between the United States of America and Great Britain. Three of the islands, St Croix, St Thomas, and St John, with others insignificant in size, were sold by Denmark to the United States, 1916–17, Denmark having made the first permanent settlement in 1672. The climate is healthy, and sugar-cane and bay rum are the principal products; there is a fair amount of live-stock, while fisheries are important. The capital, St Thomas (10,000), on the island of the same name, has a fine harbour. Area of the Virgin Islands of the United States, 132 sq. m.; pop. (1917) 26,051. The chief of the British islands (about 30 altogether, under the administration of the Leeward Islands) are Tortola, where there is situated Road Town (463), the capital and only town, Virgin-Gorda, and Anegada. Cotton is the main industry, and there is good pasturage. Area, 58 sq. m.; pop. (1921) 5082.

Virgin Mary. See MARY.

Virgin's Bower. See CLEMATIS.

Viriathus, a Lusitanian herdsman, who became a guerilla leader against the Romans, escaped the treacherous massacre by the proprætor, Ser. Sulpicius Galba (151 B.C.), soon mustered a large force, and defeated army after army of the Romans. At length he hemmed in the consul, Q. Fabius Servilianus (141), in a defile, and forced him into unconditional surrender, on condition that the Lusitanian independence should be assailed no further. But next year Q. Servilius Cæpio treacherously resumed the war against Viriathus, and ended it by successfully bribing some of his officers to murder him.

Viridian is a bluish-green pigment of much depth and purity. It is a hydrated sesquioxide of chromium, and is a valuable modern addition to the artist's palette. Neither light nor sulphuretted hydrogen gas has any action upon it, and it mixes with other colours without injuring them.

Virtues. See CARDINAL VIRTUES, and SEVEN.

Visby, a once famous seaport on the west coast of the Swedish island of Gottland or Gothland (q.v.), 130 miles S. of Stockholm. One of the most important commercial cities in Europe during the 10th and 11th centuries, during the 14th and 15th it was a principal factory of the Hanseatic League (q.v.). The eastern trade, which during the 11th and 12th centuries passed through Russia, and thence down the Baltic to Gottland, centred in Visby, and greatly enriched that port. In 1361 Valdemar III. of Denmark took the town by storm, and, plundering it, obtained an immense booty. This was a fatal blow to the prosperity of the place. The architecture of Visby is exceedingly interesting. Its ancient walls and towers exist in almost as entire a state as they were in the 13th century, and render its appearance, as seen from the sea, exceedingly striking. The early grandeur of the town is attested by the fact that it contains, well preserved, the remains of ten churches, all of which date from the 11th and 12th centuries, are varied in form and ornament, and are a mine of interest to the student of Early Gothic. The oldest is the church of the Holy Ghost (1046). St Mary's (1190–1225) is the only church now kept in repair for public worship. The Gothland museum is rich in antiquities. Pop. 10,000.

Viscacha, or BIZCACHA (*Lagostomus trichodactylus*), a species of Rodent belonging to the same family as the Chinchilla (Chinchillidæ), occurring over an immense territory on the South American Pampas and adjoining country from the Uruguay River to the Rio Negro. It is a gregarious burrower, nocturnal in its habits. Twenty or thirty live together in their villages of deep burrows, around which they keep a patch of close-cropped turf in good order, so that their numerous enemies are descried at sufficient distance to allow the slow-footed rodents time to scuttle into the pit-like mouths of the burrows. The earth brought up from the burrows forms a mound from 15 to 30 inches above the plain; and so numerous are the 'Vizcacheras' in some parts of the Pampas (especially the settled parts) that one cannot ride half a mile without seeing one or more of them. Burrowing owls and other birds also make themselves at home on the mounds of the viscacha. In unsettled regions the tame familiar rodent has deadly enemies in the puma and the jaguar. The fox, on the other hand, often establishes himself in a viscacha's burrow, and is not regarded by the full-grown natives with dread, though he lives largely on the young viscachas that get in his

Viscacha (*Lagostomus trichodactylus*).
(From Hudson's *Naturalist in La Plata.*)

way. The viscachas often ruin much of a sheep-farmer's best pasture. A full-sized male is 22 inches in length to the root of the tail, the female somewhat smaller. See Hudson's *Naturalist in La Plata* (1892).

Vischer, PETER, artist in bronze, was born at Nürnberg in 1455, and died there 7th January 1529. Among his most notable works are the tomb of Duke Ernst in the Dom at Magdeburg, St Sebald's shrine at Nürnberg, and a relief in the cathedral at Ratisbon; and in virtue of these and other works he was reckoned by contemporaries as the next artist to Albrecht Dürer. His sons, Hermann, Hans, and Peter Vischer the younger, were also distinguished as sculptors and workers in bronze. There are monographs by Headlam (in Eng. 1902), and by Daun (in Ger. 1905).

Visconti, a Lombard family who for nearly 200 years exercised supreme sway over Milan (q.v.). See Muir, *History of Milan under the Visconti* (1924).

Viscose. See CELLULOSE, SILK (ARTIFICIAL).

Viscosity is the property of matter which is in evidence when the relative motion of parts of any body or substance decays on its being left to itself. The gradual cessation of waves on the sea or of wind in the air, the dying away of sound, the frittering away of the energy of a tuning-fork are illustrations of the effect of viscosity. The property is possessed by all substances, gaseous, liquid, and solid. The kinetic theory of gases gives a very simple explanation of viscosity in

fluids, or fluid friction as it is also called. Suppose, for example, that there are two contiguous layers of gas flowing with different speeds. This fact will not prevent the individual molecules diffusing across the interface that separates the two regions. Thus the one layer will on the whole gain momentum, and the other lose it, in the direction of motion of the latter. The tendency will be to an equalisation of momentum of the two regions, and the rate at which this takes place across unit area is the measure of the viscosity. Although the molecules of a liquid have not so great freedom of individual motion as have those of a gas, still it is easy to see that a similar interaction will take place between contiguous finite portions moving relatively to one another. The action will no doubt involve dissociation or the breaking up of groups of molecules which assume other and for the moment more stable configurations. According to Maxwell's theory of the constitution of bodies, the difference between a liquid and a solid is that in the former all the groups of molecules readily break up, while in the latter only a small number do so. But it is evident that, if only one of a vast number of molecular groups so yields to the stresses acting on it, the perfect elasticity of the substance will be destroyed; the substance on recovering will not be able to give back the energy spent in deforming it. Any vibrating solid, such as a tuning-fork or wire undergoing torsional oscillations, loses more or less rapidly its energy of motion. In ordinary circumstances this loss is largely due to the resistance of the air, which is ultimately determined by its viscosity. But even if the vibrations were executed in a perfect vacuum there would still be decay of motion in virtue of the viscosity of the solid material itself. The amount of viscosity will depend upon the number of molecular groupings, which break up under influence of the imposed stresses and assume new configurations of stability. See ELASTICITY, FRICTION, STABILITY. It is interesting to note that the kinetic theory of gases implies, almost of necessity, the existence of viscosity, which is simply the diffusion of momentum.

Viscount (Old Fr. *viconte, visconte;* Lat. *vice,* 'in place of,' and *comes,* 'earl'), originally the officer who acted as deputy to the earl, the *vicecomes,* who ultimately became the sheriff (always Latinised by *vicecomes*). The hereditary title of viscount is a degree of nobility unconnected with office. It was first granted in England to John Beaumont, created a peer by the title of Viscount Beaumont in 1440. A viscount is now the fourth degree of nobility in the United Kingdom, intermediate between earl and baron, and has not been very largely conferred. The coronet is described at CORONET. A viscount is styled 'Right Honourable;' his wife is a viscountess; and all his sons and daughters are styled 'Honourable.' See COURTESY TITLES.

Vishni-Volotchok, a town of Russia in the government of Tver, 230 miles SE. of St Petersburg by rail. Pop. 20,000.

Vishṇu, 'the Preserver,' the second god of the Hindu triad, now the most worshipped of all Hindu gods. Originally in the oldest Vedas a sun-god, he gradually increased in influence at the expense of other gods (see INDIA, Vol. VI. pp. 105, 106), and in most of the later Purânas (see PURÂṆA) is the supreme god. Always a friendly god, he became specially the friend and benefactor of man in his *avatars* or incarnations, of which in some reckonings there were ten, in others twenty-two—as fish, tortoise, boar, &c. But his chief incarnations were the seventh as Râma, hero of the *Râmâyaṇa,* and the eighth as Krishṇa, the more human hero of the *Mahâbhârata.* The Vishnuite doctrines were gathered into one body before the 11th century as the *Vishṇu-Purâṇa.* Innumerable sects of Vishnuites grew up, Vaishnavas, some of whom are named after reforming teachers, such as the Chaitanyas (see SANSKRIT). Of twenty principal sects and a hundred minor brotherhoods some are merely local, others are wealthy bodies and wide-spread. In some of these, Vishṇu's characteristic attitude of sympathy for mankind forms the basis of a theology which has many affinities with Christianity, whence indeed it may have derived in part its inspiration, but in others excessive stress is laid on the belief that indulgence in the delights of love forms a legitimate mode of attaining closer union with Vishṇu himself.

Visible Speech, a system of alphabetic characters, each of which represents the configuration of the mouth that produces the sound. It is the invention of A. Melville Bell (q.v.), and was first published in 1867. A special characteristic of the system is that the letters or symbols used, of which about thirty are radical, are mostly to a certain extent pictorial of the action of the organs which produce the sound. Thus a simple circle O represents breath issuing from the *open* throat (aspiration); while the *narrowing* of the glottis which produces vocal murmur is symbolised by I, from which, by modifiers to indicate guttural, palatal, 'primary,' 'wide,' &c., all the vowel-symbols are formed. Contraction in the mouth is indicated by a C, and the *part* of the mouth in which the contraction takes place is shown by the direction in which the symbol is turned —thus C denotes contraction in the *back* of the mouth (Scottish and German *ch* in *loch*), ↄ denotes lip-contraction. Complete stoppage is indicated by drawing a line across the opening, giving a symbol resembling D, which turned this way would represent the sound of *p*, while ɑ would represent *k*. The symbols for vocality, nasality, &c., are similarly incorporated into the consonant symbols.

Visigoths. See GOTHS.

Vision, the act of seeing, that faculty of the mind by means of which, through its appropriate material organ, the Eye (q.v.), we perceive (see also PERCEPTION) the visible appearances of the external world. Vision is mainly concerned with the colour, form, distance, and tridimensional extension of objects. It is caused by impact of ether-waves on the retina of the eye (see EYE); but if these waves be longer or shorter than a certain limit (see COLOUR) there is no visual impression produced by them. The apparent colour of an object depends partly on the wave-length or wave-lengths of the incident light-waves, single or mixed, and partly upon the state of the eye itself, as in Colour-blindness (q.v.), or after taking santonine, which makes external objects look yellow, or in jaundice. The apparent brightness of an object depends upon the amplitude of the light-waves which pass from it to the eye; and the smallest perceptible difference of brightness always bears a nearly constant ratio to the full intensity of the bright objects (Fechner's psychophysical law). As between different colours, the eye perceives them with different intensities, even when the physical intensity is the same: thus yellow appears brighter in a bright light than an equally intense red: and as light fades away the different colours fade away unequally, so that the ratio in Fechner's law above referred to is different for each colour: red and yellow disappear first, blue last; and thus in a dim light the blue is the brightest.

The leading problems in the theory of vision are,

however, those which deal with the nature of our perception of distance and of three-dimensional extension. According to Bishop Berkeley, whose views (*On the Theory of Vision*) have met with the widest acceptance, we do not by means of sight perceive either that external objects are outside ourselves or their distance from us; but this knowledge is derived from touch and from our experience of motion from place to place; and as our experience is in general uniform, we come to associate the visible with the tangible so readily that we fancy we directly *see* visible objects. As regards the distance of any given point, Bishop Berkeley maintains that this cannot be seen, 'for distance being a line directed end-wise to the eye, it projects only one point in the fund of the eye; which point remains invariably the same, whether the distance be longer or shorter.' This may be true, and yet the eye may be obliged to put forth perceptibly different efforts in order to discriminate points situated at different distances. Rays proceeding from the distant point form a cone, whose base is the pupil of the eye; and in order to make this divergent cone converge on a point in the retina a distinct effort of focussing or accommodation is necessary for each distance. That the distance may be judged by means of the necessary effort of accommodation may be seen by taking a small thin-edged lens, holding it at arm's length, and viewing distant objects through it. A small inverted image of the distant objects is seen; but on trying to ascertain at what distance this image is situated, the necessary accommodation teaches us that it is situated between the eye and the lens. The effort of accommodation appropriate to each distance is the same whether the rays have actually come from the apparent distant point or not, so long as they approach at a certain angle of divergence: hence rays from clouds reflected in still, turbid water, and continuing their divergence after reflection, approach the eye, and are dealt with by it, as if they had proceeded from a great depth below the surface of the water. Similarly the apparent depth of objects under water is diminished because the amount of divergence of the rays is altered by refraction; and the apparent distance of an object is increased by repeated reflection because after such repeated reflection the rays originally diverging from the object reach the eye diverging as if they had come from a more distant point, the virtual apex of the incomplete cone of ultimately reflected rays.

The axis of the double cone of rays, first divergent as it approaches the eye, and then convergent upon the retina within the eye, fixes the direction of the apparent position of the point (which may or may not be the real position, according to circumstances), and the strain to which the eye is subjected in accommodation measures the apparent distance in that direction.

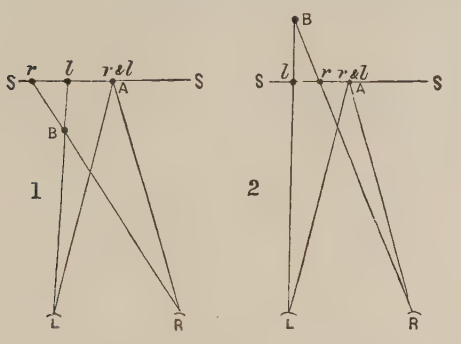
Further, we have not only to do with the effort of accommodation, but also with the varying amount of convergence of the two eyes, or of their 'optic axes,' required in order to fasten the gaze upon a more or less distant point; and this will be found to keep pace with the amount of accommodation required by each eye in order to ensure accurate focussing on the retina.

According to the Berkeleian view, however, these considerations involve geometrical questions the nature of which is known to few and is not consciously realised. But, on the contrary, it may be said that these operations of the eye being different for each distance of the object, and being felt to be so—as, for instance, where we look out through a window and feel that the sensation of looking out through the window is different from that of concentrating the gaze upon the window-bars—there is no need for the geometrical discussion of the problem; the facts of sensation are sufficient. Berkeley said that this difference of sensation does not come into play until the increased divergency becomes so great as to be associated with confused vision; and he maintained that this association was merely accidental, as was, in his view, shown by certain experiments with lenses, in which the withdrawal of the eye from a convex lens produced an apparent approach of the object looked at. This experiment was, however, shown by Wheatstone to be entirely explicable on the basis of an enlarged retinal image. Still the illusions produced by virtual images of objects, the rays reaching the eye *as if* they had come from points to which no physical reality corresponds, show that we rely in general upon the evidence of the sensations of adjustment which accompany vision for the materials as to our judgment of direction, of distance, and of externality; but we interpret these through our tactile experience. In the case of smoke and vapour, which are not tangible, we have a certain amount of experience as to the space and position occupied by them; and in the case of such an object as perfectly polished glass, which is invisible or practically so, we are left to the sense-fallacy that where the sight affords us no information, owing to the absence of any light-rays entering the eye from the object, the inference is drawn, as the basis of previous experience, that there is no tangible object to be taken into consideration. Similarly, with objects too minute for touch, we interpret the indications of sight—e.g. those arrived at with the aid of a microscope—as showing, by analogy, that if we could apply a sufficiently refined sense of touch we would feel the object to give rise to sensations corresponding to its external aspect. The two sets of sensations, visual and tactile, are essentially independent of one another; but the distance of an object and its external form in three dimensions are learned by comparing the sensations of touch, in the widest sense, with the sensations accompanying vision while the object is still beyond reach: and the experience acquired in infancy becomes a possession of the adult philosopher who has forgotten the mental processes by which he attained it. A mountain in a clear atmosphere, say in Colorado, may appear to a British eye to be small and near, when in reality it is high and far; but it does not take long to 'educate the eye'—that is, to furnish the mind with a store of experience sufficient as a basis for more accurate inferences.

On ordinary optical principles a point above the direct line of vision comes to a focus at a point of the retina below its centre, and *vice versâ*. If the retina could be looked at by another person it would be found that an image of the object is formed on the retina, and that this image is inverted. It has been much questioned how this inverted image can produce the sensation of direct vision. We may observe in the first place that the question is somewhat nugatory, since the individual never becomes directly aware of the inversion or, it may be, even of the existence of the physical image in his own retina; and secondly, that the individual has come strongly to associate, by experience, the top of an object with the act of looking up in order to see it, and *vice versâ*. Any increase in the magnitude of the retinal image is generally associated with approach of the object, and in the exceptional cases in which this result can be brought about by means of lenses, even where the real distance is increased, the object *seems* to approach; this seeming to approach being the result of an unconscious process of reasoning. The mind, on the basis of tactile experience, interprets any given object as being of a known

or ascertained size: if it comes to look larger, it is inferred that it has come nearer.

As to single vision with two eyes, the figure shows that if L and R represent the two eyes and SS a line (the 'horopter') drawn through the point A where the optic axes LA and RA intersect, and



parallel to a line joining the two eyes L and R, the point A is seen in corresponding points of the two eyes, axially situated; but two points *r* and *l* may be so placed, either in the plane of the horopter or outside it, that the two eyes together perceive them as one point B. This point is in fig. 1 nearer to the eye and in fig. 2 farther from the eye than the horopter SS itself. If now, in fig. 1, a diagram be made representing *l* and A and another representing *r* and A; and if the former be laid before the left eye and the latter before the right eye, the two optic axes being made to converge so that the image of A is formed in corresponding points in the two eyes, the points *l* and *r* will appear to blend into one, situated nearer the eye than A or farther from it; and this explains the action of the stereoscope, and also the 'pseudoscopic' effect produced when the pictures are reversed (see STEREOSCOPE). The impression of relief is thus produced by rays falling on non-corresponding points of the retina. If the retinal pictures are identical, the optic axes being convergent, the image is seen in the plane of the horopter: thus if a small-patterned wall-paper be looked at and then the eyes made to squint slightly, the wall-paper will appear to approach, for the horopter (SS, figs. 1 and 2) is now nearer to the eye, and *vice versâ*. Professor S. P. Langley estimated that the amount of Energy which is necessary, in the form of incident Light, to produce vision ranges from $\frac{1}{10000}$ erg (= 1·13562,700,000th foot-pound) for the extreme red to $\frac{1}{1000000000}$ erg for the green of the spectrum.

The subject of vision is a very large one, and the reader may be referred to Von Helmholtz's *Physiological Optics*, part iii. (German or French editions), which contains copious bibliographical references; and also to Berkeley's *Theory of Vision;* Wheatstone, *On the Physiology of Vision;* Samuel Bailey's Review of Berkeley's *Theory of Vision*, and a review of this work by J. S. Mill, *Dissertations and Discussions;* T. K. Abbott's *Sight and Touch;* Von Helmholtz's *Popular Lectures;* and Sully 'On Vision,' *Mind*, Nos. ix. and x.

Visions. See APPARITIONS, SPIRITUALISM, THEOSOPHY.

Visitation. The Festival of the Visitation, to commemorate the visit of the Virgin Mary to her cousin Elizabeth, is observed by Roman Catholics on the 2d July. For the Order of the Visitation, see FRANCIS OF SALES, and SACRED HEART OF JESUS. Visitations are amongst the duties of archbishops, bishops, and archdeacons. For Visitations by Heralds, see HERALDRY, p. 659.

Vison. See MINK.

Visp (or VISPACH; Fr. *Viège*), an old village in the Canton of Valais, at the opening of the Visp valley to the Rhone, 42 miles E. of Martigny, on the railway which in 1891 was continued to Zermatt.

Visscher, CORNELIS (1629–58), a Dutch copperplate engraver, famous for his portraits and for engravings after Guido Reni, Brouwer, and Ostade. —His brother JAN (1636–92) was also distinguished in the same branch of the profession.

Vis'tula (Lat.; Polish *Wisła;* Ger. *Weichsel*), the great river of Poland, rises at the height of 3600 feet above sea-level, amongst the outliers of the Carpathians. Formed by three head-waters, the White, the Little, and the Black Vistulas, the Vistula flows north-west a few miles to the village of Wisła, where its course is marked by a fall of 180 feet, and thence to the town of Schwarzwasser, where it leaves the mountains. At this point the Vistula turns north-east, and flows in this direction past Cracow, to its confluence with the San, 10 miles below Sandomierz. In then turns north, traverses Poland in a general north-west direction, passing Warsaw, Płock, and Thorn, flowing west-north-west to its junction with the Bromberger Canal, thence north-north-east past Kulm and Graudenz, where it turns north, bounds the German territory of East Prussia, and enters the Baltic Sea by several mouths. About 10 miles below Marienwerder it throws off an arm called the Nogat, which, taking a north-east direction, enters the Frisches Haff by about twenty mouths. The main stream, used for navigation, continues north, enters the territory of the free city of Danzig, and flows into the Gulf of Danzig at Weichselmünde, 3 miles below Danzig. The Vistula receives from the right the Bug, the San, the Dunajec, and the Wieprz; from the left, the Pillza and Brahe. The Vistula is 650 miles in entire length. It becomes navigable at Cracow for small vessels, and for large vessels at the confluence of the San; and its lower course, which is carefully and laboriously dredged and regulated, is the great outlet of the commerce of the Polish republic, but since the World War a satisfactory settlement as to the legal and international side of the question has not been reached. A great Austro-German offensive in September 1914 failed to break through the defensive line of the Vistula and San. See WORLD WAR.

Vis Viva, a term introduced by Leibniz for the product of the mass of a moving body into the square of its speed—twice the quantity now known as the Kinetic Energy (see ENERGY).

Viswamitra. See VEDA.

Vit, VINCENZO DE (1811–92), distinguished Latinist and editor of the enlarged edition of Forcellini's *Lexicon Totius Latinitatis* (6 vols. quarto, Prato, 1858–79), a Paduan by birth and an ecclesiastic by profession, was a canon of Rovigo, and town-librarian, when in 1850 he joined the brotherhood of Rosmini. His minor writings on history, archæology, and philology extended to a dozen volumes. His *Onomasticon* dealt with proper names down to the 5th century, but only reached the letter O. He also left ready for the press a supplemental seventh volume to Forcellini.

Vitaceæ, also called AMPELIDACEÆ, a family of polypetalous dicotyledons, of which the common vine may be regarded as the type. The species are natives of warm and temperate climates, all shrubs, mostly climbing; with simple or compound leaves, with or without stipules, the lower leaves opposite, the upper ones alternate; the flower-stalks racemose, opposite to the leaves, sometimes (as in the vine), by abortion, changing into tendrils. The only plant of the family of much value, from an

economical point of view, is the Vine (q.v.); but other species of Vitis (by some placed in separate genera Cissus and Ampelopsis) are planted for ornament. See VIRGINIA CREEPER.

Vitalism is the doctrine that attributed the functions of vitality, of the living organism, to a vital force distinct from the chemical and other physical forces that act in and on it. Stahl (q.v.) was the champion of the old (partly mystical) vitalism or Animism (q.v.). Schleiden and Schwann, Mayer and Helmholtz, Darwin and Haeckel, the conservation of energy and the accepted principles of evolution, were supposed to have killed vitalism in the scientific sphere. The revived vitalism or neo-vitalism of the 20th century frequently transgresses the limits of physical science to deal with what are purely speculative or metaphysical problems. See LIFE; Driesch, *History of Vitalism* (1914); Johnstone, *Philosophy of Biology* (1914). For Huxley's polemic, see BIOLOGY; see also MEDICINE and PHYSIOLOGY.

Vital Statistics, an important division of the great subject of Statistics (q.v.), which deals with the facts and problems concerning population in one or more countries. The absolute numbers of the people at various dates, the rate of increase, density, proportion of sexes, marriage-rate, ages at marriage, birth-rate, illegitimacy, death-rate, mortality at different ages, mortality in different occupations, causes of death, accidents, emigration and immigration, religions of the people, and many other subjects fall within this head. These various points are dealt with in many articles throughout this work, as in the relevant sections in the articles on countries, and in the articles named at STATISTICS. See also works there cited; books on vital statistics by Farr (1885), Burn (1914), and Newsholme (1899; rewritten 1923); the publications of the Royal Statistical Society; and the census reports and the statistical returns of the various countries.

Vitamins. The word 'vitamin' was coined in 1906, and to-day, in spite of much laborious work, we have but little clue as to the chemical constitution of the vitamins (see, however, under *Vitamin D*). They are also known as 'accessory food factors,' and Professor H. E. Armstrong has suggested 'advitant' in place of vitamin. They are numerous, and differ in their origin and solubilities; deprivation of one or other of them leads to differing forms of malady. They originate for the most part in the plant world. The plea made by certain 'food reformers' that we should rely mainly or exclusively on natural foods, the goodly fruits of the earth, is often supported by arguments in which the zeal of the enthusiasts has out-run their knowledge, but this advocacy has an element of truth. Animals have to rely in the main for the supply of these essential constituents of their diet on plants, for the animal organism has not the same synthetic power which the plant possesses. No better illustration of the interdependence and co-operation of the two sides of living nature (the botanical and zoological) could be found. In plant-life it has also been found that similar principles are essential for healthy growth, and this consideration is important for the agriculturist, but this article deals more especially with the part vitamins play in the food of animals, particularly in the food of man. Qualitatively important as they are, quantitatively they are insignificant; this very fact it was that prevented their recognition in the past; the 'importance of the infinitely little,' is the keynote of much recent physiological knowledge. There are several useful and helpful similes to aid our appreciation of the part the vitamins may play, though naturally one must be careful in applying them literally. The first we owe to Sir F. Gowland Hopkins, the pioneer in vitamin research in this country. He compares the building of the body to the building of a house. The stones, bricks, planks, &c., would be of no service unless cementing material and nails are used also. It is the cement and nails which he compares to the vitamins. Though we are ignorant of the precise manner in which they act, the analogy is correct in the quantitative sense, for just as nails and the like form but a small part of the house, so the vitamins in the food are there in minute amount—minute but indispensable. Another striking simile we owe to Lieut.-Col. R. M'Carrison; he likens the body to a petrol-engine. In order to make the car go, both the fuel and a minute spark are necessary. One is useless without the other. So it is in the body. Without the food (the fuel which supplies the material for growth, repair, and energy) the body dies of starvation. Withhold the spark (the vitamins), the fuel is not utilised; the body again is starved, and the symptoms are much the same, and also lead to death. The vitamins recognised at present are five in number, and in want of more accurate information it is usual to speak of them as A, B, C, D, and E; of these two (B and C) are soluble in water, and the remaining three (A, D, and E) are soluble in the other great solvent substance of protoplasm, namely fat. It will be convenient to take the water-soluble vitamins first; they were the earliest to be recognised, and they admirably illustrate the general truths to which attention has been called.

The Water-soluble Vitamins, Vitamin B.—In certain rice-eating communities of the East (Japan, Malaya, &c.), where the diet is more confined to this cereal than in the wheat-eating West, the very serious disease, beri-beri is endemic. It was natural for investigators to look for a positive, rather than a negative cause, and many unsuccessful efforts were made to detect a supposed microbe—for the origin of the disease is in the rice. The view taken was that the rice was bad; infected with moulds or the like. Only slowly did the correct knowledge arise, and the proof was later driven home that beri-beri followed rice ingestion because the rice had lost something essential and necessary for the body. Polished rice, unlike whole rice, is a deficient food, and the disease which follows its use is a 'deficiency disease.' As modern milling machinery was imported the number of cases increased. Clinching statistics were furnished by the Dutch physician Eijkman, whose observations dealt with over 200,000 persons.

What is removed by the mill which is so important? Not the main husk, for that was always taken off, but a very thin layer—the 'silver skin,' which lies beneath it, together with the 'germ' or embryo-plant, the sum total of which is a minute fraction of the whole grain. But even Eijkman's figures did not at once bring conviction, so saturated were pathologists with the conception that some positive intruder (microbe or what not) must be present. It was not until Hopkins did his epoch-making experiments that the conception of vitamins took firm root. He fed animals (rats) on purified proteins, fats, carbohydrates, and salts, each of them wholesome substances, employing the correct physiological amounts, and found that on such a diet young animals did not grow, and adult animals became ill; young and old both died. Something was lacking, and this could be rectified by adding to the diet a few c.c. of milk, a food made in nature's laboratory. The added milk formed but an insignificant fraction of the total diet, but with it the animals lived and thrived on

the food provided; without it they died. It was further found that animals (birds) fed on polished rice developed all the symptoms (muscular paralysis due to deficient oxidation, with or without definite nerve injury—neuritis—with lowered body-temperature) of beri-beri, and this could be counteracted, prevented, or cured, by adding the polishings (or aqueous extracts of the polishings) which the mill had removed.

Normal growth and health fail without this special vitamin called water-soluble B, because it is so easily dissolved by water. What has been said of rice is equally true of other cereals, wheat included, so the question is important to us and not only to the denizens of the Far East. The attraction of white bread may be the result of our æsthetic taste, but our recent 'war bread,' made from *whole* flour, was better than the white loaf. It enabled an enormous saving to be made in the nation's supply of flour, and, above all, was of superlative value in containing the health-giving vitamin.

Vitamin C is not the least interesting of the series. It recalls the days of long ago, and the fact that those who lived before the words 'vitamin' and 'deficiency diseases' were coined, were nevertheless dealing with the conceptions such words connote. This vitamin is the anti-scorbutic factor; it also is soluble in water, and is obtained from fruits and such edible vegetables as the potato and turnip. It was the absence of fresh fruits and vegetables in bygone times, when the long voyages of sailing ships rendered it impossible to get these commodities, that made 'the scurvy,' as it was then called, the curse of the navy and the mercantile marine. In our own day similar deprivation, such as occurs in Polar expeditions, or in prolonged sieges during wartime, has led to outbreaks of scurvy once more. The failure of the potato crop in Ireland in 1847, in Norway in 1904, in America in 1916, and the more recent shortage in 1917, led to outbreaks of scurvy in the countries mentioned, including our own (Glasgow, Manchester, and Newcastle) in 1917. Infantile scurvy, due to ignorance of infant feeding, is an ever-present danger, as every medical practitioner knows, but, as is also well known, can be easily cured by the administration of the juices of the lemon, orange, and similar fruits. Curiously enough the sour lime of the West Indies is of little value, in spite of the close botanical relationship. Of all the vitamins it is the one most susceptible to damage; prolonged heating in the presence of oxygen, canning, and similar methods of preservation, are all injurious to it. Among the many pieces of information which have followed its thorough investigation, especially by Dr Harriette Chick and her colleagues at the Lister Institute, is that these tinned products once more regain their antiscorbutic power on being allowed to germinate. This one bit of knowledge saved thousands of lives during the Great War. Whether the cooking of fruits and vegetables should be prohibited in a scientifically correct dietary is often asked. But cooking, unless very prolonged, does not destroy vitamin C entirely, and the little left is enough. A little goes a long way. Dr Zilva has prepared from lemon-juice, after removing its chief constituents (sugar, citric acid, &c.), a product which is still admittedly impure, but of which 0·00045 gramme will protect a guinea-pig (the usual experimental animal in this disease) from scurvy.

The Fat-soluble Vitamins. Vitamin A.—We have just seen that the use of a diet made of purified food-stuffs can be rendered efficient by the addition of a small amount of a natural food. A watery extract of rice- or wheat-polishings will act in the same magic way if the fat in the food is of animal origin, such as butter or beef dripping. But if vegetable fat is used instead, the addition of the cereal-extract is of no use. Vegetable fat, as fat, is a perfectly good fat, but lacks something animal fat possesses. This introduces us to the second group of vitamins, of which the first is termed fat-soluble A. Both A and B must be present in any good dietary. A diet of brown or whole meal bread and butter, not to mention accessories, is thus a good one. Replace this by white bread and margarine, and you have a bad one. It is the poor whose ignorance leads them to suppose that white bread is the best, and whose poverty compels them to eat the cheapest fat, such as vegetable margarine, who are thus most prone to stunted growth, and A is specially the 'growth-factor.'

Fat-soluble A is particularly rich in the fats of animal origin, and of all its sources cod-liver oil is the richest. The absence of fat-soluble A in vegetable fats (the basis of most margarines) is not due to its absence from the vegetable seeds, from which such fats are derived, but to the fact that the processes of extraction either leave it behind, or the high temperature used destroys it. It is present in butter, and its absence in lard is again due to the extreme heat employed in the preparation of pigs' fat (lard) for the market. Even in cod-liver oil, its potency as a remedial agent can be much diminished by any drastic agency employed in the methods of so-called refining. The vitamins are all susceptible of being destroyed by too great heat, in the presence of oxygen, and oxygen, unless elaborate precautions are taken, is always with us. But some puzzled readers may say that the fats richest in vitamin A are, on the face of it, derived from animals. How can they be of vegetable origin? The introduction of the word ultimately solves the question, for all animals live ultimately on vegetable food, and it has been found that vitamin A is specially contained in the green parts of plants, and when eaten by an animal is taken up by its fat and stored in the fatty tissue, or in the milk, or by the liver fat. The close dependence of the amount of vitamin in cod-liver and similar fish-liver oils on the habitat, and therefore on the diet of the fish (green sea plants), has been fully demonstrated. An early symptom of its deficiency is an inflammatory condition of the eyes called xerophthalmia, a condition prevalent during the Great War in those countries where the shortage of fats was most acute.

Another important aspect of the fat-soluble vitamins is the power fats have to store them. Deprivation of these vitamins is not so immediately felt as deprivation of vitamin B, for animals are able to mobilise their store, and it is not until this internal store is exhausted that its absence from the diet is fully felt. This should be remembered by expectant mothers, and storage can be utilised by the coming child while still in utero, so that it enters the world with a good supply. Milk and milk products, and the use of green vegetables also should form an important part of the mother's diet, so that she may make efficient milk; but green vegetables should form no part of the infant's diet until a later stage, when the growing child is able to digest such articles of food. Vitamin A, being *par excellence* a growth factor, is especially necessary in growing children.

What we said about the small quantity of vitamin B which is needed is equally true of the fat-soluble ones. Professor J. C. Drummond has carried out the investigation of various brands of cod-liver oil, a substance which is particularly rich in this vitamin—particularly rich, but all these

terms are relative. The absolute quantity present must, in terms of ounces or even grains, seem unimportant. At one time Drummond had in his laboratory an unrefined fish-liver oil, of which a single drop per day was able to accomplish the work of Hopkins's teaspoonful of milk already referred to. A drop of this oil, remember, is not a drop of pure vitamin, though if it were, the result would be marvellous enough. It is a drop of oil, and when one deducts from its weight the amount of known substances in it which can be estimated (the actual oil or fat, &c.), what remains? Merely an infinitesimal quantity. Could one go further as an illustration of the overwhelming importance of the infinitely small?

Vitamin D. Rickets and Sunshine.—This vitamin, formerly confused with vitamin A, differs from it in several particulars, especially in being less readily destroyed by oxidation. Like vitamin A, it is abundant in cod-liver oil, and is essential for growth, but its special action is to influence the calcification of bones and teeth; hence it is called the *anti-rachitic* factor.

The power that sunlight has in destroying disease germs is not its only good action. The effect it has on diseases is marvellous, and is especially marked in tubercular and rachitic affections. Institutions, such as those at Leysin in Switzerland, and at Alton in Hampshire, where exposure to sun-baths forms an important factor in treatment, can tell what at first sight seem fairy tales of recovery. It has been found, both in animals and human beings, that rickets can be cured as effectively by exposure to the ultra-violet radiations of the quartz mercury-vapour lamp as by the administration of anti-rachitic food (cod-liver oil). Further, it has been shown that the anti-rachitic vitamin can be produced in certain food-stuffs (such as cholesterol) by exposure to these rays. Not long ago there were opposing views on the cause and treatment of rickets; one school insisted on proper diet, including cod-liver oil in particular; another school insisted on exercise, fresh air, and especially sunlight. The discovery of the action of ultra-violet rays has shown that both were right. Drummond is of the opinion that these rays, penetrating the human skin, can make the subcutaneous fat produce its own vitamin D. Exposure of the cow to sunlight increases the vitamin D in her milk in a similar way. We thus have evidence that vitamin D is not wholly of vegetable origin. This is the only exception, so far to hand, of the general rule that vitamins originate in plants.

Not the least striking of the facts recently brought to light is the surprising resistance of the fat-soluble vitamins to powerful chemical reagents. They remain unaffected by boiling with strong alkalis. Most fatty substances are turned into soap by this treatment, but 1 per cent. or less of natural oils is not changed; this small fraction contains substances of the nature of cholesterol, and also the fat-soluble vitamins. They can be further distilled without loss (if oxygen is excluded) at the high temperature of 200° C. Clearly they must have a stable constitution, and are not fragile substances like those subtle materials known as enzymes. The hope that they will be identified chemically has been fulfilled by the work of Rosenheim and Webster so far as vitamin D is concerned. In 1927 they showed that its parent substance is not cholesterol, but an unsaturated member of the same series (the sterols) known as ergosterol, because it was first separated from ergot. It is widely distributed, contaminating cholesterol in small amount. After irradiation (but not before) it is strongly anti-rachitic. A daily dose of $\frac{1}{10000}$ to $\frac{1}{100000}$ of a milligram cures and prevents rickets in rats kept on a rachitic diet.

Later in the same year Jansen and Donath claim to have separated from rice polishings the anti-beri-beri vitamin (vitamin B) as a chloride and as a gold salt. They ascribe to it the formula $C_6H_{10}N_2O$, and hope in time to give its structural formula.

Vitamin E.—This third fat-soluble vitamin is also synthesised in plants under the influence of light. As shown by Professor Evans of California, deficiency in this vitamin lowers the reproductive capacity, sometimes in animals producing complete sterility. Deficiency in the water-soluble vitamin A leads to degeneration of the testes, but this is not regarded as its typical action, for a similar retrogressive change is noticeable in many other organs. Though vitamin E is obtainable from cod-liver oil, the best source of it is an oil obtained from the sprouting wheat-germ. Though the gaps in our knowledge of the vitamins are wide, sufficient has been said to show the importance of the subject and its possibilities in the future.

Other vitamins have been postulated, e.g. one known as 'bios' accelerates the growth of micro-organisms, and another which prevents the tropical disease called pellagra.

See *Report on the Present State of Knowledge of Accessory Food Factors*, by the Medical Research Council. See also *Physiology and National Needs*, edited by W. D. Halliburton (1919); Rosenheim and Webster, 'The Nature of the Parent Substance of Vitamin D,' (*Lancet*, 1927, i. 306); Jansen and Donath, 'The Isolation of the Anti-beri-beri Vitamin,' (*Med. v.d. Dienst der Volksgezondheit in Ned. Indie*, 1927).

Vitebsk, town in White Russia, on the Western Dwina, 380 miles S. of Leningrad, with some manufactures, and trade with Riga; pop. 80,000.

Vitellius, AULUS, Roman emperor for nearly the whole of the year 69 A.D., was born in 15 A.D., and through flattery and his congenial vices was successively a favourite of Tiberius, Caligula, Claudius, and Nero. Appointed by Galba to the command of the legions on the Lower Rhine, he allowed himself to be by them proclaimed emperor at Colonia Agrippinensis (*Cologne*) in the beginning of 69. He sent beforehand into Italy his generals, Fabius Valens and Cæcina, who closed the reign of Otho by the victory of Bedriacum. During his reign Vitellius gave himself up without restraint to beastly gluttony, spending, it is said, no less than nine hundred millions of sesterces (£7,000,000). Meantime Vespasian was proclaimed in Alexandria, and the legions of Illyricum under Antonius Primus declared for him. Cæcina betrayed his master, and Primus defeated the armies of Vitellius in two battles, then marched on the city. Vitellius was dragged through the streets and murdered, 21st or 22d December 69.

Viterbo, an episcopal city of Italy, in the volcanic area of the extinct Ciminian crater (now occupied by the Lago di Vico) on the slopes of the Monte Cimino. It was an Etruscan centre, but its importance was mainly mediæval, and it has preserved the aspect of the Middle Ages to a very great extent. Its walls are still complete, and it has a number of interesting churches and palaces, and many examples of domestic architecture (especially in and round the Piazza S. Pellegrino), hardly altered at all in the Renaissance or later periods. The material employed is usually the local volcanic stone: and the town is celebrated for its numerous fountains, which bring a continual supply of pure water; the Fontana Grande (1206–79) is the finest. In the centre of the town is the Renaissance Palazzo Comunale, and close by rises a lofty tower; but the most remarkable building is the Papal Palace (1255–67), in which several

popes were elected. The Gothic tombs of Clement IV. and Hadrian V. are in S. Francesco. Near the palace is the Romanesque cathedral, with a striped campanile. Among the finest churches of this period are Sta Maria Nuova (well restored in 1906–14), S. Sisto, and Sta Maria della Verità, now the museum, with fine frescoes by Lorenzo da Viterbo (1469), and a beautiful Gothic cloister (another is at Sta Maria in Gradi, now a prison, and a third at Sta Maria del Paradiso). In the small church of the Gesù, formerly S. Silvestro, the sons of Simon de Montfort murdered Henry of Cornwall, son of Richard II., in 1371, in order to avenge their father's death. A mile to the east is the Madonna della Quercia, a beautiful Renaissance church; the adjacent Dominican monastery has a fine cloister, Gothic below, Renaissance above; and 1½ mile further is Bagnaia, with the Villa Lante and its famous garden designed by Vignola. A mile to the west is the Bulicame, a small round pool, from which hot sulphurous water bubbles forth (Dante, *Inferno*, xiv. 79–81). The waters were much used in Roman days, as the ruins of several bathing establishments show, and are still frequented in summer. Pop. of commune (1921) 25,353.

Vitex, a genus of trees or shrubs of the family Verbenaceæ, the fruit a drupe, with a four-celled stone. *V. Agnus castus*, the Chaste Tree, a native of the countries around the Mediterranean, is downy, with digitate leaves white on the back, and has an acrid fruit, the seeds of which have been used as an external application in cases of colic. It derives its name from the practice of Grecian matrons to strew their couches with its leaves, especially during the sacred rites of Ceres, in order to banish impure thoughts; for which purpose a syrup, made of its fruit, was also used in convents in the south of Europe. The shrub is hardy in the south of England. Of the numerous species of Vitex some yield excellent timber. *V. litoralis* and *V. trifolia*, Australian and New Zealand species, have been successfully tried as sand-binders on dunes in Sicily. *V. lucens*, the New Zealand puriri, is interesting as an ornithophilous plant.

Chaste Tree (*Vitex Agnus castus*).

Viti Islands. See FIJI.

Vitis. See VINE, VIRGINIA CREEPER; also VITACEÆ.

Vitoria (in English often VITTORIA), capital of the Basque province of Álava, stands on an elevation 29 miles S. of Bilbao. The cathedral dates from the 12th century. There is a busy trade, and paper, cabinet-work, carriages, and earthenware are manufactured. Vitoria is memorable for the decisive victory which was here gained by Wellington over the French under Joseph Bonaparte and Jourdan, 21st June 1813. Pop. (1920) 34,785.

Vitré, an ancient town of Brittany, in the dept. of Ille-et-Vilaine, on the Vilaine, 24 miles E. of Rennes by rail. It has some picturesque old houses and ramparts, an interesting ruined castle (14th and 15th centuries, now partly restored), and some modern factories and foundries. Vitré was a Huguenot stronghold. Rochers, the residence of Madame de Sévigné, is 3½ miles south. Pop. 8000.

Vitrified Forts. See HILL-FORTS.

Vitrina, a genus of land molluscs, linking naked slugs and shelled snails, for its shell is delicate and partly overlapped by the skin. The British *V. pellucida* is extraordinarily hardy, and may be seen creeping on the snow. It has a peculiar, probably protective, habit of taking little jumps by jerking the end of its 'foot'; and it is also known to 'mask' itself with pieces of leaf.

Vitringa, CAMPEGIUS, divine and commentator, was born at Leeuwarden in 1659, studied at Franeker and Leyden, and became professor at Franeker, first of Oriental Languages and then of Theology. The most eminent pupil of Cocceius, he died 31st March 1722, leaving innumerable commentaries on Scripture and other erudite works (mostly in Latin), of which his commentary on Isaiah (1714–20) and the *De Synagoga Vetere* (1696) were the most important.

Vitriol (derived from the Latin *vitrum*, 'glass') is a term which the early chemists applied to glass-like salts, distinguishing them by their colours into blue vitriol, green vitriol, and white vitriol. *Blue vitriol* is sulphate of copper (see COPPER). *Green vitriol* is the popular name for sulphate of iron. For *white vitriol*, see ZINC. *Oil of vitriol*, or simply *vitriol*, is a name popularly given to commercial Sulphuric Acid (q.v.), the former in consequence of its oily appearance, and of its being formerly obtained from green vitriol. *Elixir of vitriol* is the old name for the aromatic sulphuric acid of the Pharmacopœia.

Vitrophyre, a porphyritic variety of volcanic glass. See OBSIDIAN, PITCHSTONE.

Vitruvius Pollio, a North Italian, possibly from Verona, educated under Julius, and employed by Augustus Cæsar as a civil architect and military engineer. To his patroness Octavia, sister of Augustus, he owed the competence which enabled him to write at leisure his ten books *De Architectura*. These, dedicated to Augustus, treat (1) of the principles of architecture; (2) of building materials; (3) of temples; (4) of columnar arrangement; (5) of public edifices; (6) of urban and rural architecture; (7) of house-decoration. The 8th book deals with water-supply and aqueducts; the 9th with gnomonics; and the 10th and last with mechanics. Borrowing largely from Greek authorities, he supplemented these by matter of his own, and illustrated the whole with diagrams, unfortunately lost. His professional far exceeded his literary skill—his style being bald, clumsy, and often obscure. His work, however, is the one Latin treatise on architecture, and has had many editors, commentators, and interpreters, while his most satisfactory expositor is the mediæval Italian Fra Giocondo (1435-1515), now unearthed from unaccountable neglect. Good editions of *De Architectura* are those of Rose (2d ed. 1899) and Krohn (1912); there is an Index by Nohl (1876); a French translation by Choisy (1909), and an English translation by Morgan and Howard (1915), both with text and notes. See Morgan, *Language of Vitruvius* (1906). See also THEATRE.

Vitry-le-François, a town of France, in the dept. of Marne, on the river Marne, 127 miles E. by S. of Paris by rail. The first site was at Vitry-

en-Perthois; but it was burned by Charles V. in 1544, and Francois I. rebuilt the town on its present site. It was the headquarters of Joffre in the early weeks of the World War. Pop. 9000.

Vittoria. See VITORIA.

Vittorino da Feltre. See FELTRE.

Vittorio Veneto, a small town of Northern Italy, 9 miles by rail N. of Conegliano and 26 miles N. of Treviso. Pop. of commune (1921) 24,400. It acquired its name in 1866 from King Victor Emanuel II. of Italy, but came into prominence after the Italian victory over Austria in the final battle (in Italy) of the Great War to which its name was given (24th October–3d November 1918). See ITALY (*History*), WORLD WAR.

Vitus, ST, a reputed martyr under Diocletian, the son of a Sicilian pagan, but converted by his nurse Crescentia and her husband Modestus. All three perished together, in Lucania or at Rome, the festival falling on June 15th. He is invoked against sudden death, hydrophobia, prolonged sleep, and the complaint commonly called the Chorea or Dance of St Vitus; some authorities make him also the patron of comedians and dancers. It is said that in Germany in the 17th century it was a popular belief that good health for a year could be bought by bringing gifts to his image and dancing before it on his festival—a practice especially in vogue at his chapels at Ulm and Ravensburg. Hence we are asked to believe that the Dance of St Vitus, becoming a familiar phrase, was confounded with the nervous disorder.

Vivandière, in the French and some other continental armies, a female attendant in a regiment, who sold spirits and other comforts, ministered to the sick, marched with the corps, and contrived to be a general favourite. From the Algerian campaigns onward the vivandière wore a modified (short-petticoated) form of the regimental uniform; but this arrangement was forbidden by government. Familiar from Ouida's *Under Two Flags*, the *Daughter of the Regiment*, &c., the vivandière has been superseded in her functions by the *Cantinier* (see CANTEEN).

Viverridæ. See CARNIVORA.

Vives, JUAN LUIS (generally known as Ludovicus Vives), humanist, was born at Valencia in Spain, 6th March 1492. He studied philosophy at Paris, but, disgusted with the empty quibblings of scholasticism, turned to the study of the classics at Louvain, where he taught and wrote against scholasticism, and edited the *Civitas Dei*. Thence he was summoned (1523) to England to be the tutor of the Princess Mary, and he taught at Oxford. He was imprisoned for opposing the king's divorce, and after 1528 lived mostly at Bruges, where he died, 6th May 1540. Amongst his works are *Satellitium Animi* (1524; new ed. Vienna, 1884), *De Disciplinis*, *De Ratione Discendi*, *Linguæ Latinæ Exercitatio* (1539; very often reprinted), an important edition of Aristotle's *De Anima*, works on Virgil's *Bucolics*, on the support of the poor, and in defence of Christianity. He was suspected of Protestant tendencies. He was an early advocate of education of women. See studies by Bonilla y San Martín (in Spanish 1903), and Foster Watson (1922).

Viviani, RENÉ (1862–1925), French statesman, was born at Sidi-bel-Abbès, Algeria, practised at the bar at Paris, turned to journalism and politics, and held various ministerial posts. A brilliant orator, he was prime minister from June 1914 to October 1915, in August 1914 moving the seat of government to Bordeaux, where it remained three months. After the Great War he became a warm advocate of the League of Nations.

Vivisection is now used to cover in a broad general sense all operations or painful experiments on living animals made with a view to the advancement of scientific knowledge in physiology, pathology, and curative and preventive medicine (including surgery). The methods of vivisection vary almost infinitely in severity: they include momentary and almost painless inoculations with a needle-syringe; serious surgical operations for the study of internal organs like the heart, lungs, or other viscera; experiments involving nothing but variations in the environmental temperature; verification of the physiological effects of drugs; feeding experiments in controlled conditions; communication of special diseases, and many others. There is evidence that vivisection was practised in the ancient world by Galen and the Alexandrian school, and, in later ages also, it was undoubtedly a source of valuable knowledge, both physiological and medical; but, in the 19th century, attention was directed to certain needlessly cruel and frequent experiments by certain physiologists and pathologists. The spread of information, frequently inaccurate and exaggerated, late in that century led to the formation of a strong movement for the abolition of all forms of vivisection. The movement rested primarily on the widespread revulsion against inflicting severe pain on the lower animals, even if the ultimate result were a prevention of much human suffering; but, in pressing this position, many of the anti-vivisectionists claim that the knowledge obtained by vivisection is worthless and misleading. In 1875 a Royal Commission was appointed 'to enquire into the practice of subjecting live animals to experiments for scientific purposes, and to consider and report on the measures, if any, it may be desirable to take in respect of any such practice.' That commission reported that it was impossible altogether to prevent experiments on living animals for the obtaining of knowledge applicable to the mitigation of human suffering and the prolongation of human life; that, in part, the greatest mitigation of human suffering had been derived from such experiments; and by the use of anæsthetics in humane and skilful hands the pain that would otherwise be inflicted might, in the great majority of cases, be altogether prevented and in the remaining cases greatly mitigated; that in any case, the infliction of severe and protracted agony should be avoided; that the infliction on animals of any unnecessary pain is abhorrent to the moral sense both of the general public and of the most distinguished physiologists, and the most eminent surgeons and physicians. The report resulted in considerable amendment of the law relating to cruelty to animals. Since 1876 experiments for acquiring manual skill or for public exhibition have been absolutely prohibited; experiments are permitted only to licensed persons in special places, and are controlled by certification, registration, and inspection. But it has been alleged that these restrictions still permit gross abuses and cruelty; that the information obtained is more or less valueless; and that the Act has not been properly administered. This led to another Royal Commission appointed in 1906. The commission reported in 1912. Their report and evidence are now the most reliable source existing in Britain on all the issues involved in vivisection and anti-vivisection.

In this controversy two distinct questions arise: first, is the information obtained by vivisection of any scientific value for the understanding and prevention of disease? Second, does the method of obtaining such information involve practices that must be condemned on ethical grounds? To the first question the commission's report is an overwhelming 'Yes.' Any medical man familiar

with the marvels achieved by preventive and curative medicine and surgery during the Great War, cannot doubt the value of the results of vivisection. In physiology, which is the basis of all medicine, the value of experiments on living animals is beyond dispute. In 1875 Darwin stated that he was convinced 'that physiology can progress only by the aid of experiments on living animals.' The diagnosis and treatment of heart disease has depended, in essential respects, on animal experiments. MacWilliam's experiments on the mammalian heart have, along with others, revolutionised the clinical study and treatment of heart disease, and those experiments were conducted under complete anæsthesia. The localisation of functions of the brain (Ferrier and others) have been discovered almost entirely through animal experiments, and on the basis of those discoveries rests the cerebral surgery of to-day. With very rare exceptions the use of modern drugs has first to be determined on animals. Among drugs so tested are soporifics like chloral, sulphonal, veronal; local anæsthetics like cocain, eucain, stovain; pain-reducers and fever-reducers such as anti-febrin, anti-pyrin, phenacetin, and exalgin; vascular dilators like amyl nitrite, used in angina pectoris, the most painful form of heart disease; and many others. Fortunately some of the drugs, like stovain, so tested are capable of producing complete anæsthesia for other experiments. Further, the revolution that ended in the present aseptic surgery could not have been accomplished without animal experiments. The same is true of the scientific knowledge of the great classes of infectious disease, human and animal: tuberculosis, plague, cholera, typhoid, yellow fever, hydrophobia, sleeping sickness, diphtheria, dysentery, Malta fever, tetanus, anthrax, rinder-pest, pleuro-pneumonia, glanders, and some others. In almost all of these the specific organism has been discovered, and, for some of them, preventive sera and vaccines have been produced. In most of these diseases our knowledge had reached its limit until the discovery of modern bacteriological methods, which could not have been discovered without animal experiment. Illustrations of these positions are endless. It may be laid down definitely that, so far as knowledge is concerned, vivisection has meant an incalculable advance in discovery and precision.

To the second question—whether the practices involved must be condemned on ethical grounds—the answer is more difficult. Undoubtedly there is a danger of abuse, and familiarity tends to breed callousness. But the stringent sanctions of the present law are, on the whole, sufficient to confine experiment to strictly humane purposes, and to prevent all forms of cruelty. The commission carefully considered the allegations made by representative anti-vivisectionists, and their conclusion is 'that experiments upon animals, adequately safeguarded by law, faithfully administered, are morally justifiable and should not be prohibited by legislation.' 'At the present time,' the report states, 'the average moral sense of Christian communities is not offended by the sacrifice of lower animals for the food, clothing, adornment, and, within limits, the sport of men. The right to sacrifice animal life for such purposes—to exploit animals for the service of man, as it is sometimes put—once conceded, would appear to carry with it the right to conduct experiments on living animals, provided that life is terminated without the return to consciousness and that, during the whole of the experiment, such animals are in a state of anæsthesia. . . . To prohibit such action by law in the present state of society and in public opinion would appear inconsistent, if not preposterous.'

See the arguments for and against Pasteur's method of inoculation in the article HYDROPHOBIA; numerous articles in the *Nineteenth Century*, *Contemporary Review*, *Fortnightly Review*, *Nature*, and the *Spectator*; against vivisection, the publications of the Victoria Street Society (including a paper by Lord Coleridge), Miss F. P. Cobbe's *Modern Rack* (1889) and other works on the subject, Nicholson's *Rights of an Animal* (1879), and Lawson Tait's *Uselessness of Vivisection* (1883); in favour of properly regulated vivisection, most handbooks of physiology, Gore's *Morality of Vivisection* (1884), *Physiological Cruelty* by Philanthropist (1883), and *Experiments on Animals* by S. Paget (1903; 3d ed. 1906); *For and Against Experiments on Animals*, S. Paget (1912); *Royal Commission on Vivisection*, Report (1912).

Vizagapatam, a port in Madras on the Bay of Bengal, 100 miles NE. of the mouth of the Godavari, has a fine harbour; pop. (1921) 44,711.

Vizeu, a city of Portugal, 50 miles NE. of Coimbra, with a fine cathedral; pop. 8000.

Vizianagram, an Indian town with a fort and a college, 35 miles NE. of Vizagapatam; pop. (1921) 39,299.

Vizier, or VEZÎR (Arabic *wazír*, 'bearer of a burden'), a title bestowed on the chief minister of the first Abbaside khalif, in the 8th century, for centuries denoted the president of the council of ministers and principal adviser of the khalif, and consequently the second person in authority of the Moslem empire. The various princes who founded dynasties under the khalifate also had their viziers, and the dignity and authority of the office varied considerably, till sometimes it came to represent little more than a clerkship. A famous family of viziers was that of the Barmecides under the early Abbaside khalifs, and another was that of the Kiuprilis under the Ottoman sultans. The dignity of vizier was introduced among the Turks during the reign of their second sultan, Orkhan, and the title was at first confined to the sultan's prime minister; but the prime minister's title was afterwards changed into *vezîr-azam*, 'grand vizier,' and the title of vizier was given to all the Turkish ministers of state, as well as to provincial governors. At the end of the 19th century the title of 'vizier' disappeared from general use, but the title 'grand vizier' continued until the abolition of the sultanate. See TURKEY, *Constitution*.

Vlaardingen, a town of Holland, 5 miles W. of Rotterdam, near the new Maas, with a shipping trade and large herring-fleet. Pop. 27,000.

Vlachs (shortened form of *Wallachs: Arumāni* in Vlach dialect), a nomadic Balkan people, to be found now mostly among the mountains of western Macedonia and southern Albania. Their principal villages, Metsovo and Samarina, are situated on the northern slopes of the Pindus. Opinion is divided as to whether the Vlachs are descended from Roman colonists established by Trajan in Dacia, or from Romanised hill-tribes, or from Asiatic nomads, but probably their stock is mixed. They are mentioned in the 6th and 10th centuries, but come into prominence in 1186, when Bulgarians and Vlachs rebel against the emperor Isaac, and establish (in Macedonia) an independent kingdom, which lasted till 1241. Little is known, then, till the 18th century, when the Vlachs were counted an advanced and prosperous people. They began to settle in the towns for purposes of trade, but never wholly recovered from the sack of their principal settlements, Muskopole and Shipiska, by the Albanians. A national movement began about 1867, and was soon helped by educational and political propaganda from Bucharest. In 1905 Turkey recognised the Vlachs as a separate nationality. Constant shifting of boundaries has made the history of the Vlachs a troublous one. Greek and Rumanian extremists estimate their number at

100,000 and 1 million respectively, Prof. Weigand at 373,520, and Wace and Thompson at half a million, but they are being assimilated by the surrounding nations, Greeks, Bulgarians, Albanians, and Serbs. See KUTZO-VLACHS; for the Wallachians proper, i.e. those living north of the Danube and forming the people of Rumania, see RUMANIA. The language of the Vlachs, a dialect of Rumanian and known as Macedo-Rumanian, is descended from Latin, but was not written down till the 18th century. See Wace and Thompson, *The Nomads of the Balkans* (1914).

Vladikavkaz, capital of North Caucasia, on the north side of the main Caucasus chain, and at the opening of the valley of the Terek. It is on the railway line from Rostov to Baku, and is on the only carriage road through the Dariel pass to Tiflis and the south of the mountains. There is a fortress here, and considerable trade. It also serves as capital for the Ingush and North Ossetian autonomous territories. Pop. 72,800.

Vladimir, capital of a government in the heart of Russia, stands on the left bank of the Kliasma, 120 miles NE. of Moscow by rail. It was founded in the 12th century, was the seat of a principality (see RUSSIA, *History*), and in the 14th century practically capital of Russia. It contains many historical remains, as the Kreml, the 'Golden Gate,' built in 1158, ruins of old fortifications, and many ancient churches. It is now a decayed provincial town. Pop. 23,500. The government, drained by the river Oka, has an area of 18,864 sq. m., and a pop. of 1,406,000.

Vladimir (d. 1015 A.D.), Russian chieftain. See RUSSIA, p. 845; and for Vladimir Monomachus, p. 847.

Vladivostok, a Siberian town, on Peter the Great Bay in the Sea of Japan. It has a fine harbour (ice-bound three months in the year), is a naval station, has an arsenal, and is a terminus of an overland telegraph, a submarine cable, and also of the wholly Siberian branch of Trans-Siberian railway. Founded in 1861, Vladivostok became conspicuous during the Russo-Japanese war (with a population of some 30,000), and proved invaluable to Russia in 1914 when war had closed the Baltic. During the disturbances immediately after the Great War it was used as base of operations by the British, American, and Japanese troops (see SIBERIA, *History*). A great distributing centre, it exports timber, lignite, and Manchu produce. Pop. 107,000.

Vliessingen. See FLUSHING.

Vocal Cords. See LARYNX, VOICE; also PHONETICS.

Vodena (EDESSA), a town of Greece on a mountain-slope, 46 miles WNW. of Salonika, is an important centre for the cultivation of rice; pop. 12,800. See EDESSA.

Vodka, a Russian spirit made from rye, latterly from potatoes and maize. It was prohibited in 1914. In 1925, owing to the difficulty of suppressing illicit distillation of a worse liquor and of obtaining revenue, manufacture of spirits of 40 per cent. over proof was permitted. A loan could not be got from capitalist states, and, as Mr Stalin put it, drunkenness was better than slavery.

Voetius, GISBERT (1588–1676), a pillar of Calvinistic orthodoxy, was professor at Utrecht, and, a member of the Synod of Dort, strenuously opposed the Arminians. His chief work was the *Selectæ Disputationes Theologicæ*. Other representatives of this family of Voet or Voetius (pron. *Footius*) were eminent as scholars, jurists, and poets.

Vogelweide. See WALTHER VON DER VOGELWEIDE.

Voghe'ra (anc. *Iria*), a town of Northern Italy, 16 miles by rail SW. of Pavia; pop. of commune (1921) 26,069.

Vogler, GEORG JOSEPH, composer, usually styled the Abbé (Browning's Abt) Vogler, was born at Würzburg, 15th June 1749, the son of a violin-maker. A musician from his cradle, he was ordained priest at Rome in 1773. He established at Mannheim his first school of music; his second was that at Stockholm, where in 1786 he had been appointed Kapellmeister. After years of wandering and brilliant successes as a player on his 'orchestrion,' he settled as honoured Kapellmeister at Darmstadt, and opened his third school, the chief pupils of which were Gänsbacher, Weber, and Meyerbeer. Here Vogler died, 6th May 1814. His compositions are now forgotten, still more so his new theories of music, and indeed many, with Mozart, count him but a charlatan. His name best survives in Robert Browning's poem in the *Dramatis Personæ* (1864), a splendid imaginative expression of the function of the art of music. See the study by Schafhäutl (1887).

Vogt, CARL, naturalist, was born in Giessen, 5th July 1817, and had his education there and at Bern, two of his teachers being Liebig and Agassiz. In 1847 he became professor of Zoology at Giessen, but soon lost the post for his extreme politics, whereupon (1852) he accepted the chair of Geology at Geneva. He headed an expedition to the North Cape in 1861. Chosen in 1878 a member of the Swiss National Assembly, he showed himself a thorough-going Materialist, and a champion of Darwinism in its fullest consequences. Of his many books may here be named the *Lectures on Man* (Anthropological Society, 1864), *Zoologische Briefe* (1851), *Altes und Neues aus dem Tier- und Menschenleben* (1859). He died 6th May 1895.

Vogüé, CHARLES JEAN MELCHIOR, MARQUIS DE (1829–1916), Semitic archæologist, born at Paris, travelled in Syria 1853–54 and 1861, was ambassador at Constantinople 1871–75 and at Vienna 1875–79, and was elected to the Academy in 1902. His cousin, EUGÈNE MARIE MELCHIOR, VICOMTE DE VOGÜÉ (1848–1910), born at Nice, entered the diplomatic service. Admitted to the Academy in 1888, he wrote extensively on Russian literature, books on Syria, and novels including *Les Morts qui parlent*.

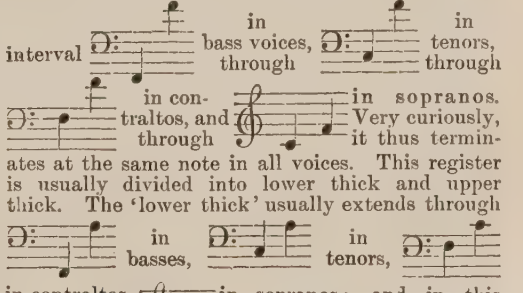
Voguls, a Ugrian people similar to the Ostiaks and dwelling south of them, between the Ob and the Urals.

Voice (Lat. *vox*), an audible sound produced by the larynx, and affected by its passage outwards through the mouth and other cavities (see LARYNX, PALATE, SOUND). When so modified in particular ways it becomes speech or song. The main differences between these two latter are that speech is more limited in compass or pitch, that it is less sustained in respect of pitch, and is not confined to the notes of a musical scale, that it is associated with a less clear or open passage for the breath, and that it presents certain utterances (consonantal, aspirate, guttural, &c.) which have not a purely musical character. The larynx is the organ by which the so-called vocal sounds (or primary elements of speech) are produced; and it was in former times keenly debated to which class of musical instruments the larynx might best be compared. As Dr Witkowski says (*Mechanism of Voice, Speech, and Taste*, Lennox-Browne's translation): 'Galien compares it to a flute, Majendie to a hautboy, Despiney to a trombone, Diday to a hunting-horn, Savart to a bird-catcher's call, Biot to an organ-pipe, Malgaigne to the little instrument used by the exhibitors of Punch, and Ferrein to a spinet or harpsichord. The last named

compared the lips of the glottis to the strings of a violin; hence was given the name *Vocal Cords*, which they still retain. The current of air was the bow, the exertion of the chest and lungs the hand which carried the bow, the thyroid cartilages the *points d'appui*, the arytenoids the pegs, and lastly, the muscles inserted in them the power which tensed or relaxed the cords. But the vocal cords are very different in their structure from strings, and no string so short as the vocal cords are could produce a clear bass note. They more resemble in their action a pair of reeds; not such an instrument as a clarionet, in which the vibrations of the column of air of any determinate length overpower the single reed, and compel it to vibrate only in rhythm with themselves, but such an instrument as may be constructed with two strips of india-rubber laid across the mouth of a wide tube so as to present a mere chink between them. But the larynx contains within itself a great power of adjustment, such as is possessed by no musical instrument; the tension of the vocal cords can be varied; the vibrating portion of the vocal cords can be shortened; the distance between them can be varied; their form can be altered, as by blunting their free edges or by flattening their whole structure; and they can be prevented from vibrating in their whole breadth, the vibrations being then confined to their margins merely: and these adjustments may be combined so as to suit different pressures of air from the lungs. Further, above and below this primary sounding apparatus there are adjustable cavities, which act as resonators, and thus (see SOUND) affect the quality of the sound produced. The actual action of the larynx as a sounding instrument has only been clear since Garcia introduced (1855) the laryngoscope (see LARYNX) as a means of observing what went on during actual vocalisation; and a flood of light has been thrown on the subject by the researches of Czermak, Merkel, Madame Seiler, and Behnke. The *crico-thyroid* muscles pull the thyroid cartilage and the cricoid cartilage together; the vocal cords are thus tightened: and the *posterior crico-arytenoid* muscles aid in this. The *thyro-arytenoid* muscles relax the vocal cords, and twist the arytenoid cartilages round so as to make their attachments to the vocal cords come over towards one another instead of lying at some distance from the middle line; and they can also so act as to press portions of the vocal cords together, and thus shorten the free vibrating edges; and further, they can squeeze their own inner portions thin, and thus flatten and thin the vibrating part of the vocal cords. The *posterior crico-arytenoid* muscles, in addition to aiding in tightening the vocal cords, twist the arytenoid cartilages so as to widen the back part of the chink between the vocal cords; while the *lateral crico-arytenoids* as well as the *thyro-arytenoids* perform the reverse operation, and thus narrow the chink, and are assisted in this by the *arytenoideus* muscle, which directly pulls the arytenoid cartilages together. These muscles in combination effect the various adjustments above spoken of. In a state of rest the glottis lies open, and respiration is unimpeded; in deep breathing the chink is still wider, but as soon as we wish to utter a note the two arytenoid cartilages rapidly approach one another, and the glottis-chink is narrowed. At the same time the superior or false vocal cords approach, but never touch one another. If the vocal cords meet one another before the current of air flows to produce the tone, there is a disagreeable jerk or click at the commencement of the note; if the air flows before the vocal cords have sufficiently approximated, there is an aspirate, and the 'attack' or beginning of the note is uncertain; the two actions ought to coincide in time, and then the 'attack' is clear and precise, for the vocal cords are brought to the right place for vibration at the very time when the air begins to tend to set them in motion.

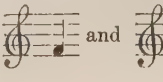
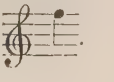
In different larynxes much depends on the relative sizes of the vocal cords; thus a man with a bass voice has longer vocal cords than a child or a woman; but as between basses and tenors, tenors and contraltos, or contraltos and sopranos, the higher voice may sometimes appear to have the longer vocal cord: on the other hand, slenderness of structure makes up for greater length, and when the vocal cords are long and slender, the voice is 'flexible,' for the cords readily enter into vibration. Further, a narrow larynx is conducive to high pitch, and so is not only the size but also the form of the female larynx, in which the upper part, above the false vocal cords, and between them and the hyoid bone, is comparatively flat. In children the larynx is small, and the voice high-pitched; but the larynx grows very rapidly at puberty; and as its different parts do not then grow with proportionate rapidity, the muscular control is uncertain, and the voice, especially in boys, breaks.

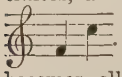
In one and the same larynx different parts or regions of the scale are produced by different laryngeal mechanism: and those notes of the scale which are produced by the same mechanism (Behnke) are said to be produced in the same *register*. The registers of the voice have given rise to a great deal of discussion, most of which appears to have arisen from independent attempts to express sensations in words. It appears, however, from the laryngoscopical evidence (for which see Lennox-Browne and Behnke, *Voice, Song, and Speech*) that the whole mechanisms can be divided into three groups, or 'thick,' 'thin,' and 'small' registers, as Curwen happily named them before the laryngoscopical evidence had come to hand. In the first the vocal cords vibrate as thick masses; in the second they vibrate in their thin edges only; in the third the vibrating chink of the glottis is much reduced in length. The lowest or thick register usually extends through the


interval
in bass voices, through
in tenors, through
in contraltos, and through
in sopranos. Very curiously, it thus terminates at the same note in all voices.

This register is usually divided into lower thick and upper thick. The 'lower thick' usually extends through

in contraltos, and does not go beyond in sopranos; and in this division the vocal cords are very bulky and thick, the *posterior* portions of the arytenoid cartilages are closely approximated, but the chink is wide and elliptical in the lower notes, less so in the upper; and the false vocal cords are far apart. In the 'upper thick' the arytenoid cartilages have rotated into complete contact with one another, so as to shorten the vibrating portion of the vocal cords: the thyroid bends down on the cricoid cartilage: the vocal cords are being stretched so that the chink between them is very narrow; and the epiglottis rises as the pitch rises. When the upper limit of this register has been reached the strain on the parts is extreme. Beyond this register comes the thin (the 'male falsetto'), which is in the female

the normal mechanism for notes between  and  .

The strain of the chest-notes, or thick register, is now relieved: the thyroid cartilage returns: the vocal cords lie still and somewhat slack at first, and the vibration is confined to their membranous edges: they are separated by a narrow chink which is at first longer than before: as the pitch rises the crico-thyroid muscle goes on acting until the thyroid and cricoid cartilages are again in apposition: and this lasts, in tenors, contraltos, and sopranos alike, through the interval  . When the note C is reached still higher notes are attained by a gradual shortening of the vocal chink, which becomes elliptical, and is gradually reduced in size. But beyond F or F♯ the soprano voice has still another register, the 'small' register. In this only the front part of the vocal cords vibrates; the vocal chink is reduced to a small aperture in front, which contracts as the pitch rises, while the hinder portions of the vocal cords are pressed tightly together. These different mechanisms produce perceptibly different qualities of tone; and the art of the vocalist is, largely, to use higher registers for lower notes, so that he may be able to strike the same note in more than one way, and thus have at command the means of smoothly passing from one part of the scale to another without *jodelling* or appearing to sing with different voices on different notes. One means of doing this in some cases is by the use of a *voix mixte*, in which the laryngeal position of the lower thick register is associated with the vibrating mechanism of the lower thin. Good singing voices have a compass of nearly two octaves, but exceptional voices have been known to extend over three octaves or even more; see BARITONE, BASS, CONTRALTO, SOPRANO, TENOR. For voice-production and voice-cultivation reference must be made to the special manuals mentioned below.

The resonating cavities and appurtenances connected with the larynx form a complex system consisting of the pockets lying between the true and false vocal cords (the effect of which cannot be very great, but which must be affected by the position of the false vocal cords), the vestibule of the larynx, the epiglottis (which directs the sound-waves towards different parts of the resonating system, and affects the colour or *timbre* of the tone produced), the pharyngeal cavity, the nasal cavity, and the mouth. When the sound-waves find a clear air-way over the tongue and under the soft palate the tone is clear; when the soft palate hangs down, so that some of the air escapes by the nose, the tone is nasal; when the tongue does not lie flat and out of the way the tone is throaty and strained; when the lips obstruct the sound-waves the tone becomes muffled. The quality of tone is also very much affected by the control which the speaker or singer may have over the breath: he should have his lungs well filled with air by abdominal respiration, and be able to attack the sound clearly with a minimum expenditure of breath, and direct the sound-waves well forward, keeping the resonating cavities large and clear; under these circumstances the voice carries through a maximum distance with a given effort, especially if, in the case of a speaker, he raises not the pitch of his voice, but its loudness when the occasion requires it: and under such conditions the pressure of air in the windpipe can be raised to a considerable height, and the voice rendered clear and telling without exhausting exertion.

Modifications in the form of the resonating cavities result, by resonance, in those modifications of *timbre* (or the relative predominance of particular harmonics of the fundamental note; see SOUND) which we call *vowels*. In pronouncing *u* (= *oo* or Italian *u*) we round the lips and draw down the tongue, so that the cavity of the mouth assumes the form of a bottle without a neck; if the lips be opened somewhat wider and the tongue be somewhat raised, we hear *o*; if the lips be wide open and the tongue in its natural flat position, we hear *a*; if the lips be fairly open and the back of the tongue raised towards the palate, the larynx being raised at the same time, the vowel produced is *e*; and if we raise the tongue still higher and narrow the lips, we hear *i*. Each of these resonance-chamber forms has its own dimensions and its own resonance-pitch; and of these *u* has the lowest pitch, as may be heard by whispering the vowels, or by means of a series of tuning-forks successively reinforced by the cavity of the mouth as a resonator; for which reason it is easier to sing *u* and *o* on low than on high notes. Diphthongs are produced by continuing the laryngeal sound during the transition from one vowel-mouth-form to another. Consonants are produced by various interruptions, total or partial, of the outflowing stream of air. If the air be completely stopped by the lips and soft palate, we have *p* when the obstruction is suddenly removed; the same action, accompanied by a certain continued sound in the larynx, and a heavier air-pressure within the mouth, gives *b*; if the air be checked by the lips, but not by the soft palate, so that it passes through the nose alone, we have *m*; if it be checked by the soft palate and by bringing the point of the tongue to the front of the palate, or to the gums, we have *t*; the same with continued laryngeal sound and greater air pressure gives *d*; the action for *d*, modified by allowing a little air to escape over the soft palate through the nose, gives *n*; if the air be checked by the soft palate and by bringing the middle or back of the tongue to the arch of the palate, we have (silent) *k* and (if there be laryngeal sound) *g*; the latter, but with the nasal passage open, gives *ng*. In other cases a continuous stream of air is made to escape under some pressure past an obstacle, and thus to sibilate; if it be driven through a narrow chink between the upper front teeth and the lower lip, the larynx being silent and no air escaping through the nose, we have *f*; the same, with greater air-pressure and a laryngeal sound, gives *v*; the true aspirated *p* and *b* (air driven with or without voice through a very narrow and small lip-chink) do not exist in English, but the latter fairly represents the German *w* in *w*asser; if the tongue be pressed tightly against or between the front teeth and air be driven through these, we have, without voice, *th* in *thin*, or with voice *th* in *then*; if in the last instance the contact be loose, we have *s* and *z* respectively; if the tongue be put in the *t* position and a little reverted, we have for tight contact *ch* and *j* (*judge*), and for loose contact *sh* and *zh* (French *juge*); if it be put in the *k* position we have for loose contact, voiceless, the Scotch *ch* in *loch*; if in the *ng* position, the Dutch *ch*, voiced, in which the soft palate vibrates, and the Welsh *ch*, voiceless. In *l* the tip of the tongue is fixed, and its sides oscillate, while a laryngeal tone is being produced; in the Welsh *ll* the position and action are the same, while a strong current of air is employed, and the larynx is silent. In *r* the tip of the tongue vibrates against the front teeth so as intermittently to shut off the air-stream, while laryngeal tone is maintained; in Welsh *rh*, as in Rhyl (Greek *ῥ*), the action is the same, with a strong current of air and larynx silent. In a 'burred' *r* (Northumberland, Parisian French, North German) the air is interrupted by vibrations of the soft palate. The aspirate *h* is produced by narrowing the air-passages, by raising the tongue and using a momentary strong current of air at the beginning of the vowel. It not unfrequently happens that

there is difficulty experienced in co-ordinating the requisite movements of larynx, tongue, and mouth, which are usually automatic, and depend upon the will to attain, by imitation, a given result; in such a case a person stutters his consonants or stammers his vowels. In many such cases the respiration is not under control, and attention to this may enable the defect to be remedied.

See MUSIC, PHONETICS, SOUND, and the books there cited; also SONG, STAMMERING, THROAT (AFFECTIONS OF THE). See also Rush, *Philosophy of Human Voice* (1845); Noiré, *Ursprung der Sprache* (1877); Browne and Behnke, *Voice, Song, and Speech* (1883); A. B. Bach, *Principles of Singing* (1885); Sir M. Mackenzie, *Hygiene of Vocal Organs* (1886); A. M. Bell, *Science of Speech* (1897); Behnke, *Speaking Voice* (1897); Javal, *Physiologie de la lecture* (1906); Taylor, *Psychology of Singing* (1908); Aikin, *The Voice, Practical Phonology* (1910); Willis, *Philosophy of Speech* (1919); Fox-Strangways, *Words and Music in Song* (1921).

Voiron, a town of the French dept. Isère, 15 miles NW. of Grenoble by rail, with manufactures of canvas, paper, and silk; pop. 12,000.

Voiture, VINCENT (1598–1648), French poet and letter-writer, was born at Amiens, and enjoyed the favour of Gaston d'Orléans, Richelieu, and Louis XIII. His brilliant sonnets and *vers de société* were the delight of the salons during his lifetime, but were unpublished till after his death; his letters are as perfect in their way as those of Balzac. His poems, which first appeared in 1650, were edited by Roux (1856), his letters by Uzanne (1880). See Sainte-Beuve, *Causeries du Lundi*, vol. xii.; E. Magne, *Voiture et les origines de l'Hotel Rambouillet* (1911).

Vojvodina, that part of the Serb-Croat-Slovene State which lies north of the Danube, till 1920 Hungarian. It consists of the Bačka or Bacska (q.v.) and the western part of the Banat (q.v.). Area 7607 sq. m.; pop. (1921) 1,380,413.

Volapük, a name made up (out of *vol*, shortened from the English *world*, and *pük* for *speak*) for a universal language invented in 1879 by Johann Martin Schleyer, a Swabian pastor afterwards engaged in teaching in Constance. The vocabulary is mainly based on English (to the extent of about a third, Latin and the Romance tongues furnishing about a fourth), and the grammar is simplified to the utmost. Declension is in every case accomplished by the addition of the vowels *-a*, *-e*, and *-i* to the root for genitive, dative, and accusative respectively; *s* is the sign of the plural; and verbs are conjugated by help of *-ob*, *-om*, *-ol*, and *-of* (for I, thou, he, she, &c.). The cause was taken up in many lands, and within ten years there were grammars of Volapük prepared in twenty languages by the author (besides a mass of others), and dictionaries innumerable; while there were over twenty papers published in Volapük, and associations in most civilised lands for the practice and extension of this artificial tongue. Subsequently the progress of the system was checked. The most practical disciples limited their aims to making Volapük a convenience for commercial correspondence, a kind of extended international code. There are grammars in English by the inventor and others, as well as dictionaries. Volapük has been almost completely superseded by Esperanto (q.v.), which in the 20th century claims to be the chief Universal Language (q.v.). See *Handbook* by Sprague (1888).

Volcanoes are more or less conical hills or mountains, usually truncated, and communicating with the interior of the earth by a pipe or funnel, through which issue hot vapours and gases, and frequently loose fragmentary materials and streams of molten rock. The pipe or funnel may be a vertical hole blown out by the subterranean forces through otherwise continuous and undisturbed rock-masses, or it may be an aperture upon a line of fracture or rent in the earth's crust. In the former case the volcano will usually be small; and should several such volcanoes occur in the same neighbourhood they will generally be irregularly distributed. There is reason to believe that all the larger volcanoes occur upon lines of fracture, and their linear arrangement or grouping along more or less well-defined belts harmonises with this view. All modern volcanic eruptions appear to take place from isolated points or foci, but in earlier ages molten matter seems frequently to have welled up and overflowed from long lines of fissure. These last are termed *fissure-eruptions*.

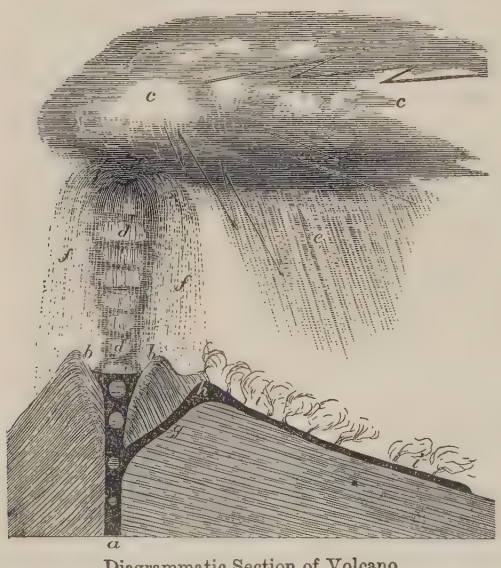
During successive eruptions the heavier portions of the loose fragmental materials—blocks, cinders, &c.—fall back within and around the vent, while lava streams from the crater, now in one direction, now in another. Thus in time a cone is built up, consisting of rudely alternate sheets of fragmental materials and lenticular flows of lava, which are all inclined outwards from the orifice of eruption. Some volcanoes are made up entirely of loose ejectamenta, but such cones are generally small, varying in size from mere monticules up to hills nearly 1000 feet in height. The stones composing volcanoes of this kind occasionally consist in large measure of the debris of the underlying rocks, such as sandstone, shale, limestone, &c., which have been ruptured, shattered, and blown into the air by exploding vapours. More usually, however, the loose materials are slags and cinders discharged from a mass of lava occupying the throat of the volcano. After a more or less prolonged ejection of slags and cinders torn from the upper surface of the lava, the latter sometimes rises into the crater and makes its escape by breaching the cone. Many of these cinder-cones are the products of only one eruption. Just as we have cinder-cones composed wholly or chiefly of fragmental materials, so we have volcanoes built up almost exclusively of lava. Some of these are of insignificant size, others are among the largest volcanoes of the world. The form assumed by a lava-cone depends chiefly upon the character of the molten rock. If the lavas be extremely viscous and tenacious they usually cool and consolidate immediately round the vent, and thus tend to form a more or less abrupt cone. Some cones of this kind have no craters—the tenacious mass having welled up and stiffened around and over the orifice so as to form a dome-shaped hill. Good examples occur in Auvergne, Bohemia, Hungary, and the Isle of Bourbon. The more liquid lavas give rise to flattened or depressed cones. The great volcanoes of Hawaii are built up almost entirely of sheets of lava which are extremely liquid at the moment of eruption, and hence readily flow away and spread themselves out as they go. By far the great majority of volcanoes, however, are composite in character—i.e. they are built up partly of lava and partly of fragmental materials—sometimes the one and sometimes the other predominating. Etna and Vesuvius are excellent examples of composite cones.

While some volcanoes occur upon the ridges of vast mountain-ranges, others are met with at much lower levels. Many have commenced their eruptions upon the bed of the sea, such as Etna and Vesuvius, which were in their younger days submarine volcanoes, and the same is the case with the vast cones of the Sandwich Islands. Submarine volcanoes have even come into existence in modern times. In 1796 a column of vapour was seen to rise from the North Pacific Ocean about 30 miles to the north of Unalashka. The ejected

materials eventually raised the crater above the sea-level, the fiery crest of the islet thus formed illuminating the region for 10 miles around. Six years afterwards, when a few hunters landed on th new island, they found the ground in places too hot to walk upon. Repeated eruptions have since increased the dimensions of the island, until now it is several thousand feet in height, and between two and three miles in circumference.

Some volcanoes are much more active than others. A few may be said to be in a state of permanent eruption, such for example as Stromboli, which has been constantly active since the time of Homer; Izalco (in Salvador, Central America), which had no existence before 1770, has continued active ever since, and is now some 2500 feet in height. Other examples of constantly active volcanoes are those of Masaya and Amatitlán in Nicaragua, Sangay in the Andes of Quito, Cotopaxi, Sion in the Moluccas, and Tofoa in the Friendly Islands. Many volcanoes, such for example as Vesuvius, continue in a state of moderate activity for longer or shorter periods, and then become quiescent or dormant for months or, as the case may be, for centuries, when they wake up to renew their labours. The eruption that succeeds prolonged repose is usually correspondingly violent or paroxysmal. Such was the famous eruption of Vesuvius that destroyed Herculaneum and Pompeii. Similarly in our own day the terrible outburst of Krakatao in the Straits of Sunda took place after a repose of 200 years.

The general phenomena of a paroxysmal eruption are illustrated by the accompanying diagram. The



Diagrammatic Section of Volcano.

neck or funnel of the volcano is shown at *a*, and the crater at *b*, *b*. Lava (represented as occupying the funnel) is highly charged with steam or water-gas and other vapours, and these, as the molten matter surges up, continually escape from its surface with violent explosions and rise in globular clouds, *d*, *d*, to a certain height, after which they dilate into a dark turbid cloud, *c*. From this cloud showers of rain, *e*, are frequently discharged. Large and small portions of the lava are shot upwards as the imprisoned vapours explode and make their escape, forming a fiery fountain of incandescent drops and fragments (*bombs*, *slags*, *cinders*), and, along with these, pieces of the rocks forming the walls of the funnel and crater are also violently discharged; the cooled bombs, slags, cinders, angular blocks, and smaller stones (*lapilli*) falling back in showers, *f*, upon the external slopes of the cone or into the crater, from which they are again and again ejected. Lightning, probably induced by the intense friction of the escaping steam, often plays round the borders of the dark cloud. The lava at last bubbles over and flows away in torrents, either from the lip of the crater or from a rent or fissure in the side of the cone. In the diagram it is represented as escaping by a lateral fissure, *g*, *h*, and streaming down the slope, while jets of steam and other vapours, *i*, escape from its surface. The outflow of lava marks the crisis of the eruption, and after a final ejection of stones and dust the volcano relapses into a quiescent state. In some paroxysmal eruptions of great violence the liquid lava is entirely blown out in the form of hot dust by one or more tremendous explosions. This appears to be the case when a considerable body of water is suddenly introduced to the heated reservoir. Such paroxysmal eruptions often result in great changes in the appearance of a volcano. The upper part of the cone disappears, and a vast yawning cauldron takes its place. This is no doubt due to the shattering of the walls of the crater by gaseous explosions, and to the undermining action of the surging lava. Much of the broken material is blown outwards, but the chief portion of the missing rock-masses has often given way and fallen into the eviscerated volcano. The cones of Etna and Vesuvius have frequently been modified in this way. Thus in 1822 the summit of the latter was reduced by 800 feet. Again, the entire summit of Papandayang in Java was blown off during a great eruption in 1772. The same appears to have been the case with Bandaisan in Japan—one of the principal peaks of which (Kobandai) was greatly reduced in height by the terrible eruption of 1888. It is estimated that 1,587,000,000 cubic yards of rock were blown from the top of the mountain and scattered over an area of 27 sq. m. The great eruption of Tarawera in New Zealand (1886) showed that both ejection and engulfment accompany paroxysmal action. Enormous quantities of material were scattered over the surrounding regions, and after the eruption there appeared in the south-western slope of Tarawera a sunken area 2000 feet long, 600 feet wide, and 250 to 800 feet deep. Many volcanoes after such prodigious action have become apparently extinct. One of the most remarkable eviscerated volcanoes of the kind is the island of Palma, one of the Canaries, from 3 to 4 geographical miles in diameter. The caldera or depressed interior is surrounded by precipices from 1500 to 2000 feet in height. These form an unbroken wall, except at the south-western end, where a deep gorge permits the passage of the torrent which drains the caldera. In not a few cases the calderas of eviscerated volcanoes are occupied by deep lakes. Examples in Europe are the Laacher See and other *maars* of the Eifel country; Albano, Nemi, Bracciano, Bolsena, Avernus, and others in Italy; Lac Paven in Auvergne; the beautiful lakes of San Miguel (Azores), &c. Similar crater-lakes are met with in many other parts of the world, such as the lake of Gustavila in Mexico, and Crater Lake in Oregon, which has a circumference of 20 miles, and is surrounded by precipitous walls rising from 1500 to 3000 feet in height. Occasionally eviscerated volcanoes are entered by the sea, when their craters appear as nearly land-locked lagoons or natural harbours. Such is the Lago del Bagno in Ischia.

Although actual extinction appears in many cases to have followed a paroxysmal eruption, yet

it is well known that this is by no means a general rule. The structure of numerous volcanoes makes this sufficiently evident. Thus Vesuvius is a cone standing in the caldera of a much larger cone, which is known as Monte Somma. The latter had evidently been eviscerated at some distant prehistoric period, and the younger cone of Vesuvius dates its origin from the time of the Plinian eruption. Since that time it has continued to increase—its growth, however, having ever and anon been interrupted by paroxysmal action. Should the volcano maintain a condition of moderate activity, the time must come when it will occupy the whole of the caldera of Monte Somma, and the latter will then become obliterated under newer ejections of lava and fragmental materials. This cone-in-cone structure is conspicuous in many other volcanoes. It is seen, for example, in Tenerife, the peak rising as a great cone from a vast caldera which is surrounded by the abrupt wall-like precipices of the older cone. The volcano of Bourbon rises in like manner in the midst of an old crater-ring, 4 miles in diameter; and the Pico de Fogo, one of the Cape Verde Islands, is another example of the same structure. The craters of volcanoes which are situated in or upon the margin of the sea are occasionally, as we have seen, converted into harbours, the water finding access by a breach in the cone. When such volcanoes wake up, a new cone or cones by-and-by appear as islets in the centre. This type of half-submerged cone-in-cone is exemplified by the Santorin Islands (Greek Archipelago), where Aspronisi and Thera are remains of a great crater-ring, in the centre of which we see the Kaimeni Islets—the product of recent eruptions. A still more perfect example of the same structure is afforded by Barren Island in the Bay of Bengal.

A volcano, as we have seen, is composed of successive sheets of erupted material, inclined outwards in all directions from the focus of eruption. This structure is eminently weak, and, subject as an active volcano is to constant vibration and frequent earthquake movements, the cone is often modified by the displacement and collapse of large rock-masses. Indirectly, however, the fracturing of the mountain is the means of strengthening the structure—for lava frequently rises in the rents and crevices that radiate outwards from the funnel, and thus forms veins and dykes which serve to brace and bind together the various parts of the volcano. In the case of volcanoes which have attained a great height it not infrequently happens that lava ceases to rise to the central crater, and is ejected through such rents and fissures lower down on the flanks of the cone or even near its base. Sometimes this seems to indicate approaching repose or even extinction. A time comes in the life of all volcanoes when they cease to erupt either lava or fragmental materials. But for a long period they continue to give out acid gases and vapour. This is called the *solfatara stage*. Eventually the last traces of volcanic heat disappear, and springs of cold water may issue from the mountain and the ground in its vicinity. Such springs are often highly impregnated with mineral matter, and frequently effervescent with carbonic acid. Many of the natural effervescent mineral waters of commerce used to come from regions of extinct volcanoes. The appalling explosions in Martinique and St Vincent in May 1902 ejected mainly enormous masses of red-hot sand, incandescent gases, and poisonous fumes, were repeated at intervals during great part of the year, and were terribly destructive of all life near the volcanoes.

The mass discharged during a volcanic eruption varies greatly. The lava from Skaptar Jokul (Iceland) in 1783 formed two main streams which flowed for distances of 40 and 50 miles respectively, and varied in thickness or depth from 600 to 1000 feet. Enormous lava-floods have likewise issued from the volcanoes of the Hawaiian Islands. In prehistoric times lava seems in many cases to have issued from long vertical fissures, and deluged wide regions. Some of these inundations of lava are well seen in western North America, as in the great basalt plain of Snake River, Idaho. The basaltic plateaus of Antrim and the Inner Hebrides, of the Faeroe Islands, and of Iceland are believed to be the denuded remains of successive massive-eruptions like those of Idaho. The volcanic plateaus of Abyssinia and the Deccan (Hindustan) have had a similar origin. As a rule the volcanoes which emit lava in greatest volume are comparatively quiet in their action. The lava simply rises and is poured out, the crater is depleted of its liquid contents, and the eruption ceases. This is the case with the volcanoes of Hawaii. While the lava is bubbling and boiling in the crater jets of the incandescent liquid are shot up more or less continuously, forming the so-called 'fire-fountains,' but the terrible explosions which accompany the paroxysmal eruptions of such volcanoes as Etna and Vesuvius are unknown in Hawaii. Hence in that region the cones are built up chiefly of lavas. The Javanese volcanoes are examples of the explosive type of volcano. In these loose ejectamenta predominate, and frequently no lava flows out. In Vesuvius and similar volcanoes we seem to have, as it were, a mean between the *quiet* and *explosive* types. The enormous energy displayed during an explosive eruption is shown by the heights to which stones and ashes are projected. According to Sir W. Hamilton, jets of lava mixed with stones and scoriæ were in 1779 thrown from Vesuvius to a height of 10,000 feet, giving the appearance of a column of fire. The fine ashes of Krakatao are said to have been carried by the uprush of gas and vapours to the amazing height of 17 miles. Remarkable solar phenomena, seen in Ceylon, South Africa, and Brazil, were attributed to the presence in the upper atmosphere of this fine dust; while in Britain gloriously coloured skies before sunrise and after sunset, months after the eruption, were attributed to the same cause. In 1845 the dust from Hekla was in ten hours lying thick on Orkney and Shetland. Ashes from Consequina fell, in 1835, in Jamaica, 700 miles off; and fine dust covered the ground 30 miles south of the volcano to a depth of 10 feet. During the great eruption of Tomboro ashes and cinders were ejected sufficient to make three mountains, each equal in size to Mont Blanc, or to cover all Germany 2 feet deep. Owing to the heavy rains which so frequently accompany eruptions, destructive torrents are formed. In many cases this water is increased by that derived from melting snows, or from the bursting open of subterranean reservoirs, or the sudden emptying of crater-lakes. Sweeping down the slopes of the mountain, the water carries along coarse and fine debris, and, reaching lower levels, often flows onward for many miles, not as a mere torrent of muddy water, but as a great inundation of soft pasty mud. Such muds are termed *mud-lavas*. Mention has already been made of the acid gases, &c. which are given off during eruptions. Occasionally hydrogen and other combustible gases are present and burst into flame. But the 'flames' that seem to issue from a crater are usually the reflection of the glowing lava illuminating the clouds of vapour, scoriæ, and ashes.

Even during its period of activity a volcano is subject to excessive denudation, and becomes seamed and scored with ravines, radiating outwards from the upper part of the cone, and deepen-

ing as they proceed towards the low grounds. Long after the volcano has become quite extinct the process of denudation is continued, until the mountain has become so reduced in size and altered in form that its volcanic character is apparent only to geologists. Extinct volcanoes, showing every stage in this process of decay, are met with abundantly in many parts of the world which are no longer disturbed by volcanic action. Often all that has been left is the choked-up pipe or funnel, with, it may be, some of the loose ejectamenta surrounding it, and a few portions of the old lava-flows. As examples in Scotland may be cited Arthur Seat, Largo Law, Knock Hill (Largs), Ruberslaw, &c. These are the mere stumps or roots of what must have been volcanoes of moderate dimensions. Now and again all that remains of a volcano is the plugged neck or funnel, such as North Berwick Law, Edinburgh Castle Rock, Loudoun Hill, the Dunian, &c.

Active volcanoes are fortunately limited to particular regions of the earth, where they are distributed at intervals, and are generally arranged in a linear direction. The Pacific Ocean is bounded by an almost unbroken line of active volcanoes—the 'belt of fire.' The coast-lands of the Atlantic, on the other hand, show hardly any, and only a few appear in adjacent islands. But the Caribbean Sea and the Mediterranean—those great transmeridional depressions—wash the shores of lands which show active and recently extinct volcanoes in considerable numbers. The volcanoes of western Asia are probably closely related to the Mediterranean depression, as those of north-east Africa appear to be to that of the Red Sea. Note also must be made of the several volcanoes and volcanic islets that rise from the depths of the great ocean basins.

The causes of volcanic action have formed a fruitful theme for chemists, geologists, and physicists, but none of the conclusions arrived at is wholly satisfactory. Sir H. Davy suggested that if immense quantities of the metallic bases of the earths and alkalies were present in the interior of the earth all the phenomena of volcanic action would be produced by their oxidation from contact with air and water. This view he subsequently abandoned, but it was again taken up and advocated by Daubeny and others. Some writers, again, have maintained that the chief cause of volcanic action is the introduction of water to the highly heated interior of the earth. In some cases—those of quiet eruptions—the water or steam is supposed to be absorbed by the lava in a gradual manner; in other cases—those of explosive eruptions—the water is believed to be suddenly introduced in considerable volume. Both these actions doubtless take place, but steam, however much it may intensify an eruption, can hardly be its ultimate cause. Some lavas, it is true, emit immense quantities, but others again appear to contain a much smaller supply; and we cannot believe that the enormous volumes of lava which flow quietly away from such lofty volcanoes as those of Hawaii have been forced up from below by the mere pressure of the moderate amount of steam which they contain. The most probable view is that volcanoes are closely related to those earth-movements which have resulted in the flexing and fracturing of strata. All the greater wrinkles of the earth's surface—its ocean-basins, continental plateaus, and mountains of elevation—owe their origin to the sinking-in of the crust upon the cooling and contracting nucleus. The crust yields to the enormous tangential pressure by cracking across and wrinkling up, in various linear directions, and it is along these lines of fracture and flexure that molten matter and heated vapours and gases are enabled to make their escape to the surface. So far, then, geologists are generally agreed as to the close relation that obtains between fracturing, folding, and volcanic action. But beyond this agreement ceases. By some it is believed that the earth is a practically solid globe—that, notwithstanding its high temperature, the interior is kept in a solid state by pressure. But as the earth parts with its heat it contracts and the crust is fractured and wrinkled up, and the pressure being relieved in this way the solid matter becomes liquefied and is forced upwards through fissures, partly by pressure and partly by the action of imprisoned steam. Others, again, think it is more probable that a liquid or viscous substratum separates the cooled crust from the solid nucleus, while some still favour the old hypothesis of a comparatively thin crust enclosing a liquid or viscous interior. According to these two latter views lava is extruded through rents and fissures formed by the yielding of the crust to tangential pressure—the lava being forced to the surface by the weight of the subsiding crust in adjacent regions. Great mountain-chains adjoin areas of dominant depression, and it is conceived that the viscous-liquid matter of the interior is displaced underneath the sinking regions while an equivalent weight is forced up through fissures in the mountain-chains, and continues to be discharged until equilibrium is restored. In this view the interstitial steam or water-gas which plays so important a part in volcanic eruptions is not the inciting cause of activity. Its presence renders the viscous matter more liquid, and its expansion doubtless increases the force of volcanic eruptions; but the extrusion of lava from the fluid or viscous interior would take place even if no steam were present. But as steam is invariably present in volcanic discharges, and as it could hardly have been derived from the supposed liquid or viscous interior, it is possible that the lava in its upward progress absorbs water from the supplies always circulating through the rocks of the crust. It is certainly remarkable that all the great volcanoes are situated within or along the margins of what are believed to be sinking areas; and the same would appear to have been the case in earlier stages of the world's history. As the continents have increased by successive ridging up of their borders, and the shore-lines of the globe have advanced seawards, the lines of chief volcanic action appear to have advanced with them. Even the few volcanoes that occur in inland regions seem to be situated within or in close proximity to subsiding areas, so that they really form no exception to the general rule. Once more, there is reason to believe that all the notable volcanoes and volcanic islets of the great ocean basins rise from the backs of ridges and swellings of the crust.

See the articles EARTH, EARTHQUAKES, GEOLOGY (with books there cited), LAVA, ETNA, HAWAII, ICELAND, VESUVIUS, &c.; works on volcanoes by Scrope, Daubeny, Judd, Hull (1892), Dana (on Hawaii, 1892), Dutton (N Y. 1904), A. Geikie on *The Ancient Volcanoes of Great Britain* (1897), T. G. Bonney (1899, 1918). And see IGNEOUS ROCKS.

Vole, a name applicable to numerous rodents in the sub-family Microtinæ, which includes field-voles, water-voles, musquash (Fiber), and lemmings (Myodes). They are distinguishable from rats and mice by their short ears, broad muzzle, short and hairy tail, and stouter body. They are vegetarian and prolific, widely distributed in Europe, northern Asia, and North America.

The Water-vole (*Microtus amphibius* or *Arvicola amphibius*) is common in Great Britain, but does not occur in Ireland. It is about the size of a brown rat, and 'rat' it is often called. The colour

varies from brown to black. Burrows are made in the banks of streams, and the food consists mainly of roots and water-plants. But excursions may be made to the fields, sometimes to potato-pits and the like. The water-vole swims and dives well, but the secondary nature of this habit is indicated by the fact that the feet are not webbed. Moreover, when the animal is swimming in a leisurely way it uses its hind-limbs only, carrying the fore-pair pressed to its sides. The ears can be closed by a kind of lid. A single litter of five or six blind and naked young is produced early in summer. It is the water-vole that is called the 'earth hound' in some parts of the country, and supposed to visit graveyards.

The Field-vole (*Microtus agrestis*) ranges all over England and Scotland, but does not occur in Ireland. It is about the size of a house-mouse,

The Field Vole (*Microtus agrestis*).

and is often called the Short-tailed Field-mouse, but it has not the prominent ears, the large eyes, the narrow muzzle, the long, bare tail of a mouse. Its fur is brownish-gray, but there is some variability. It burrows in fields and plantations, eating all sorts of vegetable food, such as roots, corn, and nuts. Stores are accumulated in the burrows, especially for use in the winter during the intervals between the long sleeps. There are three or four litters in the course of the summer, and three to six young ones are commonly found in the grassy nest, which is hidden among rough vegetation.

The Bank-vole or Red Field-mouse (*Microtus glareolus* or *Evotomys glareolus*) is slightly larger than the field-vole, and is chestnut-brown above, gray on the flanks, and nearly white below. It is placed by some authorities in a different genus, Evotomys, because the cheek-teeth develop roots in the adult. In habits and range it resembles the field-vole, but it likes sheltered places, such as gardens and hedgerows. It often does much harm in young larch-plantations, eating the bark and the buds. It works chiefly at night. The vole of Skomer Island, off the coast of Pembrokeshire, is regarded as a distinct species, *Evotomys skomerensis;* and similarly there is a distinct relative of the field-vole in Orkney, *Microtus orcadensis*, to which may be added a sub-species from Sanday Island, *M. sandayensis*. All this illustrates the tendency that variations have to become stabilised into species in insulated areas, such as islands, where inbreeding must be common. The destructiveness of the bank-vole in gardens can usually be checked by traps baited with cheese or a split bean.

The prolific and gregarious field-voles have often caused 'plagues,' e.g. in Saxony, Scotland, and Thessaly. In the south of Scotland in 1892 about 80,000 acres of agricultural land were rendered useless; and apart from plagues a heavy toll is levied every year on farm and woodland. The destructiveness is twofold, for besides devouring young shoots, sown grain, roots of crop-plants, and the bark and roots of young trees, they disturb seed-beds and growing roots, and do harm by their runs and nests to the blades of the reaping-machines. One line of prevention is to encourage some of the more tolerable natural enemies of voles, such as stoats, weasels, owls, kestrels, buzzards, and rooks. Clean farming reduces the shelter and thus the numbers. When a plague has actually begun, recourse is had to traps, pit-falls, flooding, rolling, gassing, and so forth; but it cannot be said that great success has rewarded these methods. Inoculation with a virus, which spreads, has been tried with some efficacy, but it is expensive. Perhaps the best method is to spread moist hay that has been poisoned with strychnin sulphate, about an ounce to two gallons of warm water. This has proved very effective in America. The use of crushed grain, similarly poisoned, is also very effective, but it has the great disadvantage of victimising birds. It is obvious that prevention is easier than cure; therefore the balance of nature should be respected. See Lydekker's *British Mammalia* and Simpson's *More Chats on British Mammals* (1925).

Volga (a Slav word for 'river'), the greatest river in Russia and the longest in Europe, having a course of over 900 miles in length as the crow flies, or, following its principal sweeps and sinuosities, a length of 2400 miles from its source in a marshy region in the Valdai Hills to its mouths in the Caspian Sea. It has a drainage area of 592,300 sq. m., over which there is an annual rainfall of 152 cubic miles, and its annual discharge equals 44 cubic miles, poured into the Caspian Sea through 70 mouths. About the middle of its course it has a width of over a mile. It is navigable from near its source, and a wide-spreading system of canals and its numerous tributaries combine to make the river one of the most important waterways in the world. By means of artificial cuttings it communicates with the White Sea, the Euxine, the Baltic, and the Gulf of Finland, as well as with the Don, the Dniester, the Dnieper, the Dwina, and other rivers. Thousands of steamers, and other craft in great numbers, navigate the waters of the Volga, and are engaged in the river trade, a considerable and growing part of which comes from northern and central Asia, but by far the larger portion is derived from the internal commerce of Russia in Europe. Most of the goods exhibited at the great fair of Nijni Novgorod are transported to and from their destinations by means of these river-boats. Traffic almost entirely ceases in winter, when the waters are frozen, the ice-bound stream being only used by such travellers as are compelled to journey during that inclement season, and who drive over the ice and snow in sledges. The fisheries of the Volga are of great importance, sturgeon, carp, and pike being captured in immense numbers by means of the net, the hook, and the harpoon. At the first approach of winter the fish make for the sea, but such is the quantity that large shoals, unable to advance through the crush in front, remain jammed in thick masses in the deeper pools, and are frozen over, until, at the breaking up of the ice, they fall an easy prey to the fishermen. Seal-hunting, near the shores of the Caspian, also employs a number of persons.

The scenery along the upper banks is of a monotonous forest character, marshes and swamps occupying a considerable area to the left, where the ground is low. On the right the land is higher, often rising abruptly from the stream, but farther down the country becomes almost flat, the soil generally being composed of shingle and sand,

and here navigation is somewhat impeded and rendered difficult by shoals and banks. This is a steppe region, where trees disappear, but short grass affords excellent pasturage, until, near its mouth, the river enters a desert area. The principal tributaries of the Volga are the Oka, the Kama, the Mologa, the Sheksna, the Unja, the Vetluga, and the Viatka. These are generally navigable for some distance above their mouths, and afford water trade routes to numerous towns at a considerable distance from the main river. The chief towns on the banks of the Volga are Jaroslav, Kostroma, Nijni Novgorod, Kazan, Simbirsk or Ulianov, Stavropol, Samara, and Tzaritzen or Stalingrad. These all live as it were by means of the river, and are mostly flourishing places.

The GERMAN REPUBLIC OF THE VOLGA, on the steppes of southern Russia, just north of lat. 50°, formed out of parts of the former governments of Samara and Saratov, became a labour commune in 1918, an autonomous republic of the Soviet Union in 1921. The land, drained by the Volga (which flows through the middle of the republic) is very fertile, cereals and tobacco being grown. The capital is Pokrovsk (30,000). Area 9627 sq.m.; pop. 500,000, mostly Germans, settled here during the 18th and 19th centuries. See RUSSIA, p. 842; also Bonwetsch, *Deutsche Kolonien an der Wolga, 1762–1917* (1919).

Volhynia, a former Russian government, since the Great War divided between Poland and Ukraine. The surface in the north is low, and plains and morasses, covered with forests, abound; in the south there are hills and fertile corn-bearing land. Tributaries of the Pripet drain the country. Area of the Polish province (*Wołyń*), 11,561 sq.m.; pop. (1921) 1,437,907; capital, Łuck. Area of Ukrainian Volhynia, 12,298 sq. m., cut down in the new division of the country in 1925 to about 4000 sq. m., with a pop. of 700,000.

Volition. See WILL.

Völkerwanderung. See MIGRATION.

Volkslied. See SONG.

Volney, CONSTANTIN FRANÇOIS CHASSEBŒUF, COMTE DE, was born at Craon in Mayenne, 3d February 1757. He lost his mother at two, and his youth was solitary, taciturn, and joyless, his health feeble. He studied medicine, history, and oriental languages at Paris, adopted the name of Volney for that of Chassebœuf, and travelled in Egypt and Syria (1783–87), publishing his *Voyage* (2 vols. 1787), one of the most exact and valuable works of the kind ever published, all personal details being eliminated 'to economise the time of readers'—a circumstance unique in the literature of its class. Volney was elected to the Constituent Assembly in 1789. A Liberal in politics and religion alike and a fast friend of real liberty, he was too honest and outspoken for the times, and was thrown into prison, from which he was freed only after the downfall of Robespierre. His reputation chiefly rests on his famous work, *Les Ruines, ou Méditations sur les Révolutions des Empires* (1791), a characteristic *philosophe's* essay on the philosophy of history. He filled the chair of History in the short-lived École Normale, and lived in the United States (1795–98), collecting the materials for his *Tableau du Climat et du Sol* (2 vols. 1803). In his absence he had been elected to the Institute, and soon after he was admitted to the Academy. Napoleon gave him a seat in the senate, and made him Count, and Commander of the Legion of Honour; Louis XVIII. made him a peer. Almost his latest writing, *Histoire de Samuel, Inventeur du Sacre des Rois* (1819), shows all his anti-religious bias, and his acuteness of mind, and at the same time all those 18th-century limitations of which he was happily unconscious. Volney died at Paris, 25th April 1820. His *Œuvres Complètes* fill 8 vols. (1821). See E. Berger's *Étude* (1852), and Sainte-Beuve in *Causeries du Lundi*, vol. vii.

Volo, a port of Thessaly, on the Gulf of Volo, 37 miles by rail SE. of Larissa. Pop. 25,000.

Vologda, a town of north-eastern Russia, stands on both banks of the river Vologda, 260 miles NE. of Moscow by rail. It has considerable trade, and a pop. of 53,000.

Volsci, an ancient Italian people, extending from the south-western slopes of the Apennines to the sea, along both banks of the Liris (*Garigliano*), whose capital was Suessa Pometia, and, after its destruction by the Romans, Satricum and Antium. The Volsci were a brave and warlike people who waged almost incessant war with the Romans for 200 years previous to 338 B.C., when they were finally subdued, their territory incorporated into Latium, and they themselves created Roman citizens. The legend of Coriolanus (q.v.) is connected with the Volscian wars. See ROME, TARQUINIUS SUPERBUS, ANTIUM, UMBRIA.

Volsk, a town of Russia, on the Volga's right bank, 70 miles NE. of Saratov, with various industries; pop. 34,000.

Volstead Law. See LIQUOR LAWS, UNITED STATES.

Volsungs, a famous heroic race in old German legend, its founder Volsung or Walsung, the grandson of Odin, and its brightest ornament Volsung's son, Siegmund. Sigfried or Sigurd, hero of the Nibelungenlied (q.v.) is of the same stock. The tale is enshrined in the Old Icelandic Volsunga-saga, which has been followed by W. Morris in his *Story of Sigurd the Volsung.*

Volt (derived from Volta, the physicist), the unit of electromotive force now in universal use among electricians. It is defined legally in terms of the ohm and ampere (see ELECTRICITY). An instrument for measuring voltage is called a voltmeter. The *voltameter* is an instrument for measuring current, as explained at Electricity (q.v.).

Volta, a river of Upper Guinea which, rising in the Kong mountains or highlands behind the Ashanti country, runs southward between Ashanti and Dahomey, and reaches the Bight of Benin through the eastern part of the British Gold Coast. To left and right of its mouth it forms great lagoons, and on the bar across the mouth a heavy surf runs.—For the French colony of Upper Volta see the article SENEGAMBIA.

Volta, ALESSANDRO, physicist, was born at Como, of a noble family, 19th February 1745, and in 1774 he was appointed professor of Natural Philosophy at Pavia, the duties of which office he discharged till 1804, when he retired to his native town to spend the rest of his days; and having been summoned to show his discoveries to Napoleon, and received medals and titles at home and abroad, he died 5th March 1827. It was he who mainly developed the theory of current electricity along purely physical lines (see ELECTRICITY); the term *voltaic* is justly used in many cases instead of *galvanic* (see GALVANI); he it was who discovered the electric decomposition of water, and invented a new electric battery, the electrophorus, and an electroscope. He also made many investigations on heat and gases. Complete editions of his works appeared in 1816 (5 vols.) and 1918 (4 vols.); and there are monographs on him by Bianchi and Mochetti (1829–32), and by Volta (1875).

Voltaire, FRANÇOIS MARIE AROUET DE, was born on 24th November 1694 in Paris, where his father, François Arouet, held a responsible post in

the Chambre des Comptes. His mother, who died during his childhood, was well-born and a friend of the famous Ninon de L'Enclos. His godfather, the Abbé de Châteauneuf, exerted a pernicious influence on the precocious boy, and taught him to scoff at religion. In his ninth year he entered the Collège Louis-le-Grand, the chief French seminary of the Jesuits. He soon distinguished himself as a versifier, and the college authorities thought worthy of print his ode to St Geneviève. Although it was devotional in tone, the letters of his schoolboy days are those of a youthful sceptic. Before he had entered his teens he was introduced to Ninon de L'Enclos, who was so struck by him that she left him a legacy of 2000 francs with which to buy books. Leaving college at seventeen, he was destined by his father for the bar, but the study of law disgusted him. His poetic talents, lively conversation, and already pronounced scepticism procured him a welcome from the so-called 'Society of the Temple,' among the members of which were the Anacreontic Abbé de Chaulieu and the Duc de Sully, with other men of rank. Alarmed by the dissipated life which he was leading, his father gladly saw him admitted into the suite of his godfather's brother, the Marquis de Châteauneuf, who after the treaty of Utrecht was appointed French ambassador to Holland; but in consequence of an intrigue with a young lady Arouet, after a few months' stay at the Hague, was sent home in disgrace. In obedience to the command of his exasperated father he entered the office of an attorney, but his stay in it was short, and in a few months more he obtained notoriety as the author of a satire on his successful rival in the poetic competition for a prize offered by the French Academy. After the death in 1715 of Louis XIV. Arouet was suspected of lampooning the regent, the Duc d'Orléans, and was banished for several months from Paris. The evidence that he was the author of a subsequent lampoon, accusing the regent of detestable crimes, satisfied the authorities of his guilt, and he was thrown into the Bastille (May 1717), where he was confined for nearly a year. Meanwhile he had written his tragedy *Œdipe*, and had begun a poem, the hero of which was Henry IV. of France. With his liberation from the Bastille he assumed the name of Voltaire, which is supposed to be an anagram of Arouet l(e) j(eune). *Œdipe* was performed in Paris (18th November 1718) and was triumphantly successful. His next dramatic attempts were, comparatively, failures, and he devoted himself to the completion of his poem on Henry IV., which was to be published by subscription. But he had selected for a hero a prince whose chief distinction was the championship of the Protestant cause, and the poem contained praises of religious toleration and an unflattering description of the papacy. All this induced the authorities to refuse the sanction needed for publication. Voltaire had the poem surreptitiously printed at Rouen (1723) and smuggled into Paris, when, as *La Ligue ou Henri le Grand, Poème épique*, it was widely read and greatly admired. Voltaire was pushing his way at court, and being patronised by the newly-wedded queen of Louis XV., when there occurred the catastrophe which drove him from France. A certain Chevalier de Rohan-Chabot, a scion of the great house of Rohan, addressing him contemptuously as a parvenu, Voltaire retorted with spirit, and seems to have written and circulated some caustic epigrams on the man who had insulted him. The chevalier's revenge was to have Voltaire cruelly beaten by his hirelings. The authorities refusing him proper redress, Voltaire resolved on challenging the cowardly author of the outrage, with the result that Voltaire was once more thrown into the Bastille. After a short imprisonment, he was liberated on the condition that he would proceed forthwith to England, where he landed about the end of May 1726.

Voltaire brought with him letters of introduction to several persons of station. Bolingbroke, with whom he had been intimate in France and who was now in England, made him known to Pope and his circle. He made the acquaintance of Peterborough, Chesterfield, the Herveys, and heard from the Duchess of Marlborough anecdotes of the times of Queen Anne. He became more or less intimate with Young, with Thomson, and with Gay. Having learned to read English with ease, and even to write it intelligibly, he acquired some knowledge of Shakespeare and Milton, Dryden and Butler, and a familiarity with what Pope had written, with Addison's *Cato*, and with the so-called dramatists of the Restoration. He was strongly attracted to Locke among philosophers, and he mastered the elements of Sir Isaac Newton's astronomical physics. Bolingbroke's conversation and the writings of the English Deists furnished him with many of the weapons of which he made use in his subsequent attacks on the theology of Christendom. George II.'s consort, Queen Caroline, accepted his dedication to her of the *Henriade*, the new form of *La Ligue* (the publication of which had been one of the objects of his visit to England); and the list of subscribers to it included with the king and queen a number of the nobility and gentry. When he was permitted to return to France early in 1729, after a residence of nearly three years in England, he took with him, among other fruits of his literary industry in exile, his *History of Charles XII.* and the materials for his *Letters on the English.* The letters were full of contrasts, certain to offend the ruling powers in France, between English liberty, political, and especially intellectual, on the one hand, and French despotism of every kind on the other.

On his return to Paris Voltaire laid the foundation of what became great wealth, by the sagacious purchase of shares in a government lottery, and by speculations in the corn-trade, to the profits of which were added a few years afterwards those arising from large army contracts. He formed a very close intimacy with Madame du Châtelet (q.v.), a lady of distinguished connections, very clever, accomplished, and scientific, whose husband was a cipher. He had a château, Cirey, in Champagne, and thither Voltaire fled in the summer of 1734, an order having been issued for his arrest on the publication, unauthorised by him, of his *Letters on the English*, accompanied as they were by heterodox comments on Pascal's *Thoughts.* Soon he and Madame du Châtelet made Cirey their headquarters. At Cirey Voltaire continued *La Pucelle*, a shameless libel on Joan of Arc; wrote dramas, *Mérope* and *Mahomet* among them; poetry, philosophical and other; his *Treatise on Metaphysics;* much of his *Siècle de Louis Quatorze* and *Les Mœurs et l'Esprit des Nations*, with his *Elements of the Philosophy of Newton.* Here he fitted up a laboratory and studied physics and chemistry; and here he received (August 1736) the first letter written to him by his admirer, the Crown-prince of Prussia, afterwards Frederick the Great. Since the appearance of his *Letters on the English* he had been out of favour at court. But he wrote at the instance of his friend the Duc de Richelieu a dramatic piece, the *Princesse de Navarre*, which was performed on the occasion of the Dauphin's marriage (February 1745); and its adroit adulation pleased Louis XV. This and the patronage of Louis's new mistress, Madame de Pompadour, procured him the appointments of royal historiographer and of gentleman-in-ordinary to the king,

as well as his election to the French Academy—distinctions which he sorrowfully owned were due to anything but his really meritorious contributions to the literature of his country. The court favour which he now enjoyed proved to be fitful. In 1747 an imprudent speech at a court card-party drove him to take refuge with an old friend, the Duchesse de Maine, for whose amusement he now wrote *Zadig* and others of those oriental tales which are among the most popular of his writings. When he was allowed to reappear at court, some injudiciously expressed flattery of Madame de Pompadour excited the indignation of the queen, and Voltaire had again to migrate. Oddly enough he and Madame du Châtelet became the welcome guests at Lunéville of ex-King Stanislaus, the French queen's father. A *liaison* with a young officer resulted in the death (September 1749) of Madame du Châtelet after she had given birth to a child of whom her new lover was the father.

The king of Prussia had more than once urged Voltaire to reside permanently at his court. But Voltaire would not consent unless he were to be accompanied by Madame du Châtelet, and to this arrangement Frederick had an insuperable objection. By her death a chief obstacle was removed. In July 1750 Voltaire found himself at Berlin, with the office of king's chamberlain, a pension of 20,000 francs, and board and lodging in one of the royal palaces. But the friendship of the king and the poet was soon disturbed. Voltaire entered into some questionable financial and other operations in association with a Berlin Jew. The result was a lawsuit, and during the proceedings disclosures discreditable to Voltaire irritated the king against him. Frederick was still more gravely offended by Voltaire's satirical criticisms on Maupertuis, whom the king had made president of his Academy of Science and for whom he had a great regard; and in March 1753 Frederick and Voltaire parted, never to meet again. The chief literary result of Voltaire's stay in Prussia was the completion and publication of his *Siècle de Louis Quatorze*.

Soon after leaving Prussia Voltaire was arrested and kept for several weeks in confinement at Frankfort, partly through the bungling of Frederick's representative in that city, who had been instructed to recover from Voltaire a volume, privately printed, of the king's poems. Voltaire avenged himself by writing the well-known and malicious sketch of Frederick's character and account of his habits, which, however, was first printed, and then surreptitiously, after the writer's death. After various wanderings Voltaire settled, early in 1755, near Geneva. From Les Délices, as he called his first Swiss home, he removed about 1758 to Ferney (q.v.), which was in French territory, some 4 miles from Geneva on the northern shore of the lake. During the first five years of his settlement in Switzerland appeared his greatest historical work, *Les Mœurs et l'Esprit des Nations*, his pessimistic poem on the earthquake of Lisbon, and its prose-pendant, the famous *Candide*. The suspension of the *Encyclopédie* by the French government, and the sentence of the parliament of Paris condemning to be burned by the public executioner a harmless poem of his own on natural religion, impelled Voltaire to issue his celebrated declaration of war against L'Infâme. In 1762 appeared the first of those writings assailing the Christian faith which flowed from his pen until the end of his life. In the same year occurred at Toulouse the judicial murder of Jean Calas (q.v.), falsely accused of having, from Protestant zeal, killed one of his sons to prevent him from becoming a Roman Catholic. Voltaire exerted himself strenuously, and at last successfully, to have the sentence annulled, and to rescue other members of the Calas family from the punishment to which, as unjustly convicted accomplices, they had been condemned. This and similar efforts on behalf of victims of French fanaticism procured Voltaire the gratitude of numbers of his countrymen, the applause of other nations, and, ever since, the admiration of many to whom his attacks on Christianity have been and are utterly repugnant. It is not so well remembered that even in theology he endeavoured to exert a conservative influence, and that he was regarded as a reactionary by the adherents of the atheism which during his later years became fashionable in France. The unadulterated atheism of Baron d'Holbach's *System of Nature*, issued in 1770, he vehemently opposed; and five years before the appearance of that work Horace Walpole reported from Paris the speech of a French lady who said contemptuously of Voltaire: 'He is a bigot, he is a Theist' (*Il est bigot, c'est un déiste*).

The varied activity of Voltaire in his old age was immense. Among the works which he composed while domiciled in Switzerland were histories of *Russia under Peter the Great* and of the *Age of Louis XV.*; the *Dictionnaire Philosophique*, still often dipped into; a *Treatise on Toleration*; and *Fragments on the History of India*; besides tales, philosophical treatises, and tragedies and comedies. He kept up an enormous correspondence, resuming that with Frederick, and entering into a new one with the most friendly of his crowned admirers, the Empress Catharine of Russia, whom he urged with great but fruitless fervour to drive the Turk out of Europe, and to revive, as far as it could be revived, the ancient glory of Greece. He looked keenly after his many and widely-spread investments, made so successfully that his later income was computed to amount to what would now be £20,000 a year. He farmed, reclaiming waste land, planting, rearing poultry, and breeding horses. What is more striking, he established at Ferney a watch-making industry which competed with that of Geneva, and which he fostered by appeals on its behalf to all and sundry, from the Empress Catharine downwards.

The death in 1774 of Louis XV. removed the principal obstacle to a visit of Voltaire to Paris, but it was not paid until 1778, when he was in his eighty-fourth year, and then ostensibly to superintend the arrangements for the performance of his last tragedy, *Irène*. After an absence of thirty-four years he arrived in Paris in February 1778, and was welcomed enthusiastically by all that was most distinguished socially and intellectually. When he drove out the progress of his carriage was obstructed by the pressure of immense and acclaiming crowds: 'It was he who defended the Calas' was the reply of one among them who was asked by his neighbour the reason for the prevalent excitement. Frantic, literally, was the enthusiasm, which a house crowded to suffocation displayed for hours on the occasion of his visit to the Comédie Française to witness the representation of *Irène*; one of the leaders of the applause being the Comte d'Artois, afterwards Charles X. These and other excitements, telling on the infirm frame of the old man, brought on an attack of illness which was aggravated by an injudicious administration of opiates. Delirium alternating with torpor supervened, but with intervals of lucid consciousness. A few hours before his death two priests entered the sick-room, and to a professional appeal from one of them he replied, 'Let me die in peace.' The end came on the night of the 30th May 1778.

The Voltaire literature is very large, and a *Bibliographie* (4 vols. 1882–91) was collected by Bengesco. Outstanding French works include Desnoiresterres,

Voltaire et la Société au XVIII^e Siècle (2d ed. 8 vols., 1887); Nicolardot, *Ménage et finances de Voltaire* (new ed. 1887); Lives by Faguet (1895), and Lanson (1906); books on *Shakespeare et Voltaire* by Lounsbury (1902), and Baretti (1911); Caussy, *Voltaire, seigneur de village* (1912). In English, the *Life* by Parton (1881) is very full, but uncritical, while Morley's *Voltaire* (1872: new ed. 1886) is more a criticism than a biography; there are. Lives by Espinasse (writer of the above article, 1892), and Tallentyre (1903); and a book on *Voltaire in England* by Collins (1908). The *Sechs Vorträge* of D. F. Strauss appeared in 1870 (Eng. trans. 1876). See the Correspondence of Voltaire with Mdme. du Deffand, Frederick the Great, &c.

Volterra (anc. *Volaterræ*), a town and episcopal see of Tuscany, 35 miles SW. of Pisa by rail. It is built on a hill of Pliocene clay, which at the extreme north is gradually giving way, so that some of the buildings of the town have already been swallowed up in the abyss, as well as the earliest Etruscan necropolis. The Etruscan city walls are well preserved, and numerous tombs have been found, mostly containing cinerary urns of the 3d century B.C. The walls are over 5 miles long, and enclosed a much larger area than that of the mediæval city, which, however, made use of the south side of them, and of the Porta dell' Arco, one of their gates. A large fortress was also built at the south-east angle, which has been a prison since 1818. Close by is a Roman reservoir. The Piazza Maggiore is among the finest mediæval piazzas in Italy, with the Palazzo Pretorio and the Palazzo dei Priori: and the cathedral and baptistery, in the Pisan style, with striped façades, form an interesting group; both contain fine sculptures. There are also numerous mediæval houses with towers. Pop. of commune (1921) 16,507.

Voltri, a coast town of Italy, 9 miles W. of Genoa by rail. It has numerous manufactories, and is the westernmost industrial suburb of Genoa. Pop. of commune (1921) 15,890.

Volturno. See VULTURNUS.

Volumes, LAW OF. See CHEMISTRY.

Volumetric Analysis. See ANALYSIS.

Voluntaryism, the polity of those who insist on the absolute separation of church and state, disapprove utterly of church endowments and state grants for religious purposes, seek the disestablishment and disendowment of established churches, and recognise alone as consistent with true religious liberty and equality the support of churches and clergy by the voluntary payments by the members. Most Nonconformists are more or less voluntaries. For the 'Voluntary Controversy' in Scotland, see UNITED PRESBYTERIAN CHURCH; and for the arguments for and against state churches, books cited at STATE RELIGION.

Volunteers and Territorial Army. In moments of national danger there has repeatedly been a spontaneous uprising of persons willing to give military service in defence of the country. In the Napoleonic era, corps of various types were formed from 1782 onwards till, in the year 1803, a volunteer army of nearly 400,000 men had enrolled itself to resist the apprehended invasion of England. The force was untrained and unarmed; when the danger passed it was rapidly dissolved. In 1859, when there seemed to be a renewed possibility of invasion, the volunteer spirit revived, and it was resolved that if volunteers would equip themselves with uniform, accoutrements, and arms, and supply themselves with military instructors, all at their own expense, the state would accept their services. Men of all professions and trades thronged to enrol themselves, and the numbers soon swelled above 180,000, artillery and riflemen; little more than a year after the first enrolments, Queen Victoria reviewed two great bodies in Hyde Park and in Queen's Park, Edinburgh, numbering in all about 80,000. The expectation at first had been limited to some thousands of sharpshooters, and the company was taken as the largest unit. But the numbers, the drill, and the capacity for organisation shown by the new force made its consolidation into the larger unit of the battalion a thing of course, and soon it was administered, exercised, and dealt with from headquarters in battalions, as were the regiments of the regular army and the militia. In 1888 it was organised in district brigades, each under a brigadier-general.

But the volunteers could not long be expected thus to tax themselves while giving their actual time and labour without pay or reward. Accordingly it was resolved to relieve the volunteer of outlay, to clothe him, and pay the expenses of organisation of the corps, exacting efficiency as a condition of the grant. After the Franco-German war it became the custom to place volunteer battalions in brigade with the regular troops at manœuvres on a large scale; and by 1892 every district of the country saw volunteers camping out either in battalion or brigade. The force had increased in numbers practically to a quarter of a million, and great reviews were held by Queen Victoria in 1881 in Windsor Park and in Queen's Park, Edinburgh. In connection with the army reforms of 1872–81 the volunteers were incorporated formally with the territorial regiments of their districts, so that the corps in each district became the volunteer battalions of its regiment. In 1886 every volunteer rifleman was provided with greatcoat, water-bottle, haversack, and means of carrying a full supply of ammunition, so that in the event of mobilisation every man could be turned out ready to march. Until 1888 the artillery had no field-guns, and were exercised only at fort-guns; but thenceforward a large proportion were trained as batteries of position with modern heavy field-guns. Volunteer officers were further examined in drill to pass as lieutenants and for promotion to the higher ranks. Mounted contingents were encouraged, and signallers, stretcher-bearers and cyclists trained. In 1892 a special decoration for officers was sanctioned, and a medal for non-commissioned officers and privates of twenty years' service.

In 1899–1902 a force of Imperial Yeomanry, with a total strength of 35,520, went out to South Africa in three contingents, and the value placed on their services was shown by an act of 1901 which raised the general status of the force to that of the militia. Volunteers to the number of 19,856 also served, either in service companies, attached to their regular regiments, or in the specially organised City of London Volunteers. The work of these selected individuals won praise from high authorities; but the volunteers as a whole were severely criticised a few years later by the Royal Commission of 1904, which pointed to their inefficiency and want of organisation, and unanimously concluded that they were unfit to take the field against the troops of a continental army.

The reforms of 1907–8 were directed to remedy these faults, and the Territorial and Reserve Forces Act of 1907 introduced fundamental changes into the character and status of the old auxiliary forces. While the militia had given its substance to form a reserve to the first line, the yeomanry and volunteers were remodelled and reorganised into a self-contained second line or army for home defence under the title of the Territorial Force. To them was assigned a definite rôle in time of war to supply garrisons and to repel raids. The volunteers furnished the infantry, and the yeomanry the mounted brigades, with the exception of the 2 Irish

regiments, which were reformed into special reserve units. The volunteers (so-called) were retained, however, in India and some crown colonies. When complete the Territorial Force, with transport and supply companies, ambulances, &c., was to have 4 constituent parts. (1) Fourteen divisions of 3 infantry brigades of 4 battalions each, with 8 companies to the battalion. The divisional areas were those of the regular military districts, but London and the two Lancashire districts furnished two divisions each. (2) Fourteen mounted brigades. The yeomanry were on a four-squadron basis, and their previous territorial distribution was preserved. (3) Army troops or units not required to complete the divisions. (4) Special troops for defended ports, under a coast defence commander. A medical organisation on the lines of the Royal Army Medical Corps was recruited largely from civilians in medical practice. It included a system of general hospitals and a nursing service, organised in co-operation with the British Red Cross Society and the St John Ambulance Association. Arrangements were made for the establishment of a Territorial Force reserve. Apart from the Territorial Force, and outside the territorial army organisation, is the Officers' Training Corps, instituted in 1908, in two divisions—a senior or university corps, and a junior or school corps. Their function is to provide facilities and a standard training for those who wish to become officers in the special reserve or Territorial Force. The command and training of the Territorials in peace and in war are exclusively in the hands of the regular general officers commanding in chief. The infantry officers and non-commissioned officers are assisted by the training-units of the special reserve distributed over the United Kingdom, and forming schools of instruction, in which those responsible for the units can themselves receive specialised training at the hands of regular officers. Training-brigades for artillery and training-squadrons for cavalry perform the same service for those arms. The coast-defence artillery are practised in war duties in association with regular troops at the ports which they will be called on to defend.

Administration is no less exclusively assigned to separate authorities, the Territorial Force (later, the Territorial Army) associations. These are county bodies, constituted under schemes framed by the Army Council, and composed of members representing various military and civil interests, the lord-lieutenant being nominally the president. Members are of three classes—(1) military, who are officers representing all arms of the Territorial Army, and must number not less than half the whole association; (2) representative, recommended by county councils, county borough councils, and universities; (3) capital, among whom may be included representatives of employers and workmen. Their duty is generally to acquaint themselves with the plans of the Army Council, and to cope with the detailed labours of organisation and administration at all times other than those of training and mobilisation. These services are provided out of public funds allotted by the Army Council. The associations are federated into a representative council, which conveys their collective opinion to the War Office. The Territorial Army is further represented at the War Office by an advisory council, composed of selected presidents of associations and officers of the force, under the chairmanship of the civil members of the Army Council. All matters relating to the Territorial Army at the War Office come before the director-general of the Territorial Army and his staff, who are in the department of the civil members.

The conditions of service differ considerably from those of the yeomanry and volunteers, and the Territorial Army and Militia Act of 1921 (which changed the title of the force to 'Territorial Army') introduced further modifications in this respect. The Territorial Army is organised for imperial defence, and can only be sent overseas by the passing of a special Act of Parliament authorising its despatch. It can only be embodied after the army reserve has been called out, will serve in its own units, and will not be used to supply drafts for the regular army. Enlistment is for three years for trained men and four years for others, the age for enlistment being from eighteen to thirty-eight. Annual training in the form of drills, musketry, and training in camp is compulsory, training in camp amounting to fifteen days with full army rates of pay. Bounties of five and four pounds are given to trained men and recruits respectively who complete their annual training. Penalties are provided for failure to fulfil obligations; but there is no enforcement in the case of leave lawfully granted, sickness, or other reasonable cause for absence. The Territorial Army is not liable to be called out to repress civil disturbance. Appointments to first commissions as officers are made without examination on the recommendation of the president of the county association or of the commanding officer. Officers are at all times subject to military law. The rank and file are, generally speaking, so subject whenever performing any military duty. A man may be discharged on medical grounds, for misconduct, or if not likely to prove efficient. The man discharged has a right of appeal to the Army Council. While serving, members of the Territorial Army enjoy exemption from certain civil duties, such as jury service.

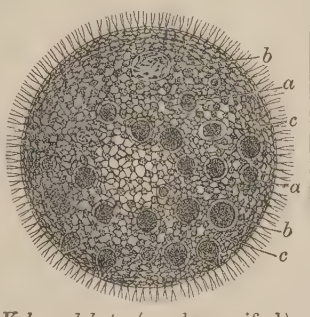
The strength of the old Volunteer forces of all arms in 1907 was 248,416, and of the Territorial Force in 1914 about 265,000. On the outbreak of the Great War, an overwhelming majority of the Territorial Force volunteered for service abroad, although originally destined for home defence only. In 1916, when conscription came into force, all units became liable for foreign service. Regulars and territorials went abroad in such numbers that units of volunteer infantry began to be formed in every county. These were manned by men over age and by men exempted from the conscription for medical reasons, or on the ground of being 'indispensables' in their occupations, or for compassionate reasons. Motor-car Volunteers were also formed. Uniform was supplied to the infantry, who were drilled once or twice a week. They were meant solely for home service, and took turns in guarding dangerous points. They were disbanded after the ratification of the Treaty of Versailles. Later, an Air Defence Force was attached to the Territorial Army. At the beginning of 1927 the total strength of the whole force was given as 146,522. The T. D. ('Territorial Decoration'), which in 1908 superseded the V.D. ('Volunteer Decoration'), is awarded to commissioned officers of twenty years' good service, and the Territorial Long Service Medal was substituted for that formerly given to Volunteers.

Volusenus, FLORENTIUS (Florence Wilson, or Wolsey), a distinguished Scottish humanist, was born near Elgin at the opening of the 16th century. Having received his early education in Scotland (probably at Aberdeen), he seems to have proceeded to the university of Paris. Like his contemporary and personal friend George Buchanan, he cultivated classical learning in preference to the logic and philosophy of the schoolmen, and attained a mastery of Latin which gives him a place with the first scholars of his time. After acting as tutor to a son (spoken of as a nephew) of Cardinal Wolsey, he eventually became principal of a school

at Carpentras, near Avignon, a position he owed to the favour of Cardinal Sadoleto. In 1546, on his way home to Scotland, Volusenus (we have no authority for the name *Wilson*) died at Vienne in Dauphiné, lamented by Buchanan in a Latin quatrain. His chief work is his *De Animi Tranquillitate*, written in the purest classical Latin, every page of which reveals the essential refinement and moral beauty of his nature. See Irving, *Lives of Scottish Writers*, and *The Bannatyne Club Miscellany*, vol. i.; Hume Brown, *Surveys of Scottish History* (1919).

Volute, in Architecture, the spiral ornaments of the Ionic and Corinthian capitals, probably derived from Assyrian architecture, in which it is also used. See illustration at COLUMN; also EVOLUTE.—The volute shells, forming the Gasteropod family Volutidæ, are chiefly tropical shells, many of them of great beauty and much valued by collectors. The only common British species is *Voluta tornatilis;* valuable ones are *V. imperialis, V. musica,* and *V. junonia.*

Volvox, a genus of simple organisms which some authorities regard as animals and others as plants, but which are in fact not very emphatically the one or the other. They consist of green flagellate cells, united by protoplasmic bridges in a hollow spherical colony, and occur in ponds, canals, and clear fresh-water pools. Botanists claim them as Algæ, referring them to a family of the order Coccophyceæ; zoologists claim them as animals, as colonial flagellate Infusorians. Each unit of the colony is somewhat like the common Hæmatococcus; and sometimes there may be as many as 12,000 forming one ball, which then measures about 1 mm. in diameter. Volvox is a very beautiful organism, and is full of interest to the biologist. Thus, as regards reproduction, one may be found quite asexual in its multiplication, another may be described as parthenogenetic, a third produces special male and female cells, while in others the sexes are separate. Within one species all these phases may occur, epitomising the whole evolution of sex. As a very simple many-celled organism Volvox also gives some hint as to transition from Protozoa to Metazoa. Nearly related are the genera Eudorina, Pandorina, Gonium, and Stephanosphæra.



Volvox globator (much magnified): *a*, female cells; *b*, stages in development of male cells; *c*, ordinary flagellate cells.

Volvulus. See COLIC.

Vomer, a bone which, in the human skeleton, forms part of the middle partition of the Nose (q.v.). It exhibits many modifications in the different classes of Vertebrata.

Vomiting. The physiology of vomiting has already been discussed (see DIGESTION, Vol. III. p. 823); and it only remains to indicate its significance in disease, and its treatment. It is much more common and more easily induced in children than in adults, and generally speaking in men than in women. In some cases it is entirely salutary—e.g. when poison, or food irritating in quality or excessive in quantity, has been taken, and it should be encouraged and not checked. It is common, especially in children, as a symptom of the onset of many acute diseases. When persistent or recurrent it most frequently depends upon disease of the digestive organs, particularly the stomach. But this is by no means necessarily the case; during the early months of pregnancy vomiting ('morning sickness') is so common as hardly to be abnormal; in consumption, Bright's disease (see under KIDNEYS), and disease of the brain (tumour, abscess, meningitis) it may be for a time the most prominent, or even almost the only symptom. (In the vomiting attending brain disease, rarely under other circumstances, nausea, or the sensation of sickness, may be entirely absent.) It is obvious therefore that it is of the greatest importance to discover in the first instance the real cause of the vomiting, and attempt to remove it by suitable treatment. Some of the means most generally useful in checking vomiting may, however, be mentioned. Food should be administered in a liquid form, and in very small quantities at a time (e.g. milk diluted with an equal quantity of potash-water, or lime-water, not more than a wine-glassful at once), or even for a time withheld altogether. Small pieces of ice sucked or swallowed, and a mustard poultice or fly blister applied to the pit of the stomach are often useful. Of drugs, preparations of bismuth, hydrocyanic acid, creasote, chloroform, lime-water, ipecacuanha wine (in doses of a single drop every hour), cocaine, opium, and morphia are among the most valuable.

Vómito Negro ('Black Vomit'), an acute form of Yellow Fever (q.v.).

Vondel, JOOST VAN DEN, a great Dutch poet, born at Cologne, 17th November 1587, kept a hosier's shop in Amsterdam, and died there, 5th February 1679. Of his thirty-three plays the most interesting is *Lucifer* (1654), which suggests in some points a parallel with *Paradise Lost,* on which a preposterous case of borrowing has been constructed by Gosse (*Studies in North. Lit.,* 1879), and still more by Edmundson (*Milton and Vondel,* 1885). The latter also finds in *Samson Agonistes* plagiarisms from a classical drama of Vondel's, *Samson; or Divine Vengeance.*

Lennep made a complete edition of Vondel's works (12 vols. 1850–69), which was revised by Unger (1888–94). See studies by Baumgartner (in Ger. 1882), Looten (in Fr. 1889), Brom (in Dutch, 1907); and the bibliography by Unger (in Dutch, 1889; trans. 1911); also HOLLAND, p. 747.

Voodoo. See NEGROES.

Voragine, JACOBUS DE. See GOLDEN LEGEND.

Vorarlberg, the most westerly land of Austria, bounded by Bavaria, Tirol, Liechtenstein, and Switzerland. In this Alpine region live stock are raised. By a referendum in 1919, about 80 per cent. voted in favour of admission into Switzerland as a 23rd canton, and there was some talk also of union with Bavaria, but neither proposal came to anything. The capital is Bregenz (13,000), situated on the Lake of Constance. Area, 1055 sq. m.; pop. (1923) 139,999.

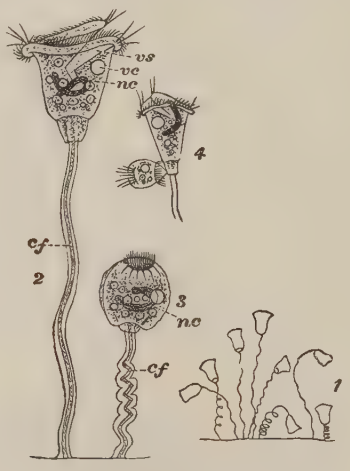
Voronezh, a town of Russia, on the right bank of the Voronezh, 300 miles SE. of Moscow, with a considerable trade. The Russian University of Dorpat, dispossessed by the Great War and Esthonian independence, was reorganised at Voronezh in 1918. Pop. (1920) 92,773.

Vörösmarty, MICHAEL (1800–55), Hungarian romantic writer, born at Nyék, produced some splendid epics (*Flight of Zalán,* &c.) and dramas (*Vérnász,* &c.), translated Shakespeare, was for a time Director of the Hungarian Academy, and took a prominent part in national politics. Some of his works have been translated into German.

Vortex, in the ordinary meaning of the term, is a whirlpool. We find illustrations of it, on a large

scale, in tornadoes, waterspouts, and whirlpools, and, on a smaller scale, in eddies of air or water produced by conflicting currents. If we draw the half-immersed blade of a teaspoon gently along the surface of tea or coffee we shall see two small eddies following in the wake of the edges. These eddies are the visible ends of a half ring of whirling liquid, which is formed originally as a fringe to the blade of the spoon. Similar effects may be observed in rowing as the oar is lifted out of the water at the end of the stroke. The general characteristic of such eddies is a rotational motion of the smallest visible portion in the centre. From this we readily pass to the scientific conception of vortex motion in fluids. Imagine a continuous frictionless fluid, which cannot therefore be molecular, for that would imply Viscosity (q.v.); and suppose any small spherical element to become solidified. If this elementary sphere is found to be rotating about any axis, there is vortex motion in the fluid at the region occupied by the element. If there is no vortex motion, the elementary sphere will have no rotation however complicated the motion of the fluid may be. Von Helmholtz, who first investigated the properties of vortex motion, showed that where vortex motion once exists in a frictionless fluid it must always exist, and where at any instant it does not exist it never can exist. Moreover a vortex with ends cannot exist in the fluid. Either it must form a closed ring or it must continue through the fluid until it stops at the boundary. These properties mathematically proved for the perfect frictionless fluid cannot be fully realised in practice. Indeed the possibility of forming vortex rings depends on the existence of viscosity; and the same viscosity finally destroys the vortex motion so produced. Vortex smoke-rings are often formed at the firing of a gun or mortar or even from the funnel of an engine, or on a smaller scale by a puff of tobacco smoke emitted from the mouth of a skilled smoker. Vortex rings may be produced with great ease by projecting them through an orifice in one side of a closed box whose opposite side is made of cloth or sheet india-rubber or other elastic material. To make the rings visible we may produce inside the box a cloud say of sal-ammoniac; and at every tap on the elastic side of the box a very evident vortex ring will be ejected. When one such vortex ring is following another, the one in front will open out and let the other shoot through it. This one in its turn will open out and slacken speed, while the one that is now behind will contract and accelerate its pace and pass through the other and again get in front. Von Helmholtz showed that this action would go on indefinitely in the perfect fluid. The laws governing the collision and vibration of vortices may also be illustrated by means of smoke rings in air. Lord Kelvin's conception of the material atom as a vortex ring of simple form, or of any degree of beknottedness, though now superseded, was one of the brilliant conceptions of the 19th century. Such a vortex atom in a frictionless plenum would be as indestructible as the hard Lucretian atom, and yet be capable of vibration. See ATOM, HYDRODYNAMICS.

Vorticella, or BELL-ANIMALCULE, a genus of ciliated Infusorians belonging to the order Peritricha, in which the cilia are restricted to a fringe around the mouth. During most of their life the little animals are attached to the stems and leaves of plants in fresh-water pools, a group being just visible to the unaided eye as a whitish fringe. Each is a bell-shaped unit borne on a hollow stalk containing a contractile filament, whose activity causes the stalk to change frequently and instantaneously from a state of complete extension to a state of spiral contraction. Around the mouth of the bell there is a spiral fringe of cilia, which, by their lashing activity, waft food-particles into the mouth. A vorticella often reproduces by division, one of the halves being set adrift, furnished with a posterior circlet of cilia. Or it may be that after division into two one of the halves, still undetached, divides rapidly into eight small units,



Vorticella (after Howes):
1, general appearance of a group, magnified; 2, single individual fully extended; 3, the same with spirally contracted stalk; 4, liberation of half of a divided unit; *nc*, nucleus; *vs*, mouth; *vc*, vacuole; *cf*, contractile filament of stalk. Nos. 2, 3, 4, highly magnified.

which, becoming separate, swim off (also with posterior cilia), and conjugate with sedentary individuals of normal size. This is one of the early hints of sexual dimorphism.

Vorticism, a British movement in painting, developed just before the Great War out of the Futurism (q.v.) of Marinetti. It is a blend, too, of Cubism and Expressionism (q.v.), emphasising the complications of machinery that characterise the vortex of present-day life. The leader was Wyndham Lewis, and with him were associated E. Wadsworth, C. R. W. Nevinson, J. Epstein, and the poet Ezra Pound. Some interesting war pictures were produced by this group. See PAINTING, p. 697.

Vortigern (*Guorthigirnus;* Welsh, *Gwrtheyrn;* O.E. *Wyrtgeorn*), the British prince reported by Bede, Nennius, and Geoffrey of Monmouth to have invited the Saxons into Britain to help him against the Picts, and to have married Rowena, daughter of Hengist (q.v.). His allies soon became, according to the legend, enemies even more dangerous than the Picts. Samuel Ireland (q.v.) fathered his 'historical' play of *Vortigern* on Shakespeare.

Vos, CORNELIS DE (1585–1651), a painter who adhered to the manner of the older Dutch school, and became famous for portraits, and religious and mythological pieces.—His brother PAUL (1590–1678) painted animals and hunting scenes.

Vosges (Lat. *Vogesus,* Ger. *Vogesen* or *Wasgau*), a range of mountains running north from the Gap of Belfort, divides Alsace and Lorraine, and extends into the German Palatinate to near Bingen on the Rhine. The total length is about 170 miles, and the greatest width about 40 miles. It runs parallel with the Black Forest, on the right bank of the Rhine, which it much resembles in its picturesque pine forests and granite structure. Vines are also grown on the lower slopes, and rock-salt and other minerals are found. The highest summits, including Ballon de Guebwiller

(4667 feet), are to be found in the southern portion, which from 1871–1919 formed the boundary between France and Germany. During the Great War much severe fighting took place in this region, which was covered by the forts of Épinal and Belfort. See Wolff, *Country of the Vosges* (1891); Betham-Edwards, *In the Heart of the Vosges* (1911).

Vosges, a dept. in the north-east of France, formed out of the south part of the old province of Lorraine. The surface is mountainous, the hills being well wooded, while the western plain is very fertile. There are lignite and other mines. Weaving and lace-making are carried on, and there are various manufactories of machinery, &c. Area, 2303 sq. m.; pop. (1886) 413,707; (1921) 383,684; (1926) 382,100. It is divided into the five arrondissements Épinal, Mirecourt, Neufchâteau, Remiremont, Sainte-Dié. The capital is Épinal. There are numerous mineral springs, Plombierès, Contrexéville, Vittel, &c.

Voss, JOHANN HEINRICH, scholar and poet, was born of poor parents at Sommersdorf in Mecklenburg, 20th February 1751. At first a tutor, he began in 1772 to study at Göttingen, and there joined the famous Dichterbund. From theology he soon turned to Greek and Roman antiquities under Heyne. In 1778 he went from the editing of the *Musenalmanach* at Wandsbeck to be rector (schoolmaster) at Otterndorf. Here he prepared his translation of the *Odyssey*. In 1782 he became rector of Eutin, whence in 1789 he issued his translation of Virgil's *Georgics*. His controversies with Heyne form his *Mythologische Briefe* (2 vols. 1794); in answer to Creuzer he wrote *Antisymbolik* (2 vols. 1824–26). In 1802 he settled in Jena, was called in 1805 to a chair at Heidelberg, and there died, 29th March 1826. At Heidelberg he translated Horace, Hesiod, Theocritus, Bion, Moschus, and Tibullus; other translations were Aristophanes and (with the aid of his two sons) Shakespeare—a work far inferior to Schlegel's. His original idyllic poem, *Luise* (1795), yet lives. See biographies by Paulus (1826) and by Herbst (2 vols. 1872–76).

Voss, RICHARD (1851–1918), German writer, born at Neugrape in Pomerania, published a long series of poems, dramas, and romances, of which *Magda* (1879), *San Sebastian* (1883), *Schuldig* (1892), *Allerlei Erlebter* (1902), *Brutus auch Du* (1917) are the best known.

Vossius, GERARD JAN, a great 17th-century scholar, was born of Dutch parents near Heidelberg in 1577. He studied at Leyden, and became in 1600 rector of the school at Dort, in 1615 of the theological college of Leyden. His *Historia Pelagiana* (1618) offered a modest apology for the Arminians, which brought down upon him the wrath of the orthodox. He anticipated his dismissal by resignation. Laud procured him a prebend without residence worth £100 a year. In his book *De Historicis Latinis* (1627) he made a prudent recantation. In 1632 he was appointed to the chair of History in the newly-founded Athenæum at Amsterdam, and here he died, 27th March 1649. All his life he had toiled with ceaseless industry, of which the chief monuments are *Aristarchus sive de Arte Grammatica, De Historicis Græcis, Commentariorum Rhetoricorum sive Oratoriarum Institutionum Libri VI., De Veterum Poetarum Temporibus Libri II.*—ISAAC VOSSIUS, his son, was born at Leyden in 1618. He travelled in England, France, and Italy, collecting many valuable manuscripts, and in 1648 took up his abode at the court of Queen Christina of Sweden, but returned to Holland in 1658. In 1670 he settled in England, and here, although a scoffer and a libertine, was appointed by Charles II. a canon of Windsor. He died there in 1688, and it is recorded that on his death-bed he refused to take the sacrament until one of his colleagues argued that he ought to do so for the credit of the chapter.

He was the first to edit the six shorter epistles of Ignatius (1646). Other works were editions of the geographer Scylax, Justin, Pomponius Mela, and Catullus, besides contributions to chronology.

Vostitza, now officially *Aigion*, a Greek town with a good harbour, on the Corinthian Gulf, 25 miles by rail E. of Patras; pop. 10,000.

Voters. See ABDUCTION, BALLOT, REGISTRATION, REPRESENTATION, PARLIAMENT, WOMEN'S RIGHTS.

Votes. See TSCHUDES.

Votiak Territory, an autonomous region of Russia, created out of part of the government of Vyatka. The Votiaks, who form about half the population, are a Finno-Ugrian tribe. The capital is Izhevsk (44,300). Area, 11,170 sq. m.; pop. (1920) 730,326.

Votkinsk, a mining town of Russia, 40 miles N. of Sarapul, with important manufactures of machinery. Tschaikowsky was born here. Pop. 25,000.

Vow (Lat. *votum*), a voluntary promise made to God, and, as such, carrying with it the most stringent obligation to its fulfilment. Vows, as religious acts connected with the notion of sacrifice, were common to all the religions of antiquity. In Israel they were regarded at times as absolutely irrevocable—the vow of Jephthah is a case in point—but the laws of Leviticus provided for their commutation or redemption by money (Lev. xxvi.). The practice of vows did not cease in apostolic times (Acts, xviii. 18; xxi. 23), and in the later and mediæval church the system received a very extensive development. The Protestant churches, by a reaction against the abuse of monastic vows, discarded the practice altogether. In the Roman Church, however, vows are held to be of divine institution and intimately connected with the most perfect state of the Christian life. A vow is defined by Catholic theologians to be a promise to God *de meliori bono*—i.e. the matter or object of the vow must be, in moral worth, superior to its opposite. Thus, a vow to marry would be ordinarily null, for the married state is not considered to be in itself better than the unmarried. Vows are mostly concerned with the evangelical counsels as distinguished from the precepts of the Christian law, and with acts of supererogation or of conduct not otherwise obligatory. But a vow to observe a precept gives to it a greater moral value, invests its observance with the character of divine worship, and obtains for it higher merit. The vow of chastity, and that of entering a religious institute that has solemn vows, are, if made unconditionally after the age of eighteen, 'reserved to the pope'—i.e. cannot be dispensed from except by authority from the holy see. Otherwise the making of simple vows is left to the discretion of the individual, and dispensation from them for a just cause can be obtained from the bishop or religious superior. The church, however, takes under her special charge, or is said in a solemn manner to accept certain vows which on that account are called *solemn* as distinguished from *simple* vows. The three solemn vows of poverty, obedience, and chastity, involving complete and irrevocable surrender, essentially constitute the 'religious' state. A solemn vow of poverty deprives the subject of all dominion over property. More important is the distinction in reference to the vow of chastity. A simple vow of chastity renders subsequent marriage

illicit but not invalid, while a solemn vow nullifies marriage. Yet all monks and nuns do not take solemn vows. In certain communities, and in some countries where the civil legislation interferes with the observance of these vows in their integrity, simple vows are taken. By papal decrees simple vows are substituted at least for a period even in the older orders. In the Society of Jesus a certain select number only after many years are admitted to the three solemn vows, and to these vows is then added a fourth, of special obedience to the pope. By a peculiar exception, however, the vow of chastity taken by a Jesuit after his noviciate, though a simple vow in other respects, is made to annul marriage. It should be noted that a priest at his ordination makes no explicit vow of chastity; but the celibacy to which he is bound is treated canonically as a vow, implied in his acceptance of sacred orders. A vow differs from a promissory oath inasmuch as the oath is said merely to call God to witness to the reality or sincerity of the *promise* at the time it is made. The neglect to fulfil it is commonly thought to contract no greater guilt than what is already involved in the non-fulfilment of the natural promise.

Vowel. See PHONETICS, VOICE.

Voysey, CHARLES (1828–1912), preacher, was born in London, studied at St Edmund Hall, Oxford, held various livings in the Anglican Church, but was ejected in 1869 on account of his heterodox doctrines, whereupon he founded the Theistic Church. His chief work on *Theism* appeared in 1895. See THEISM.

Vranja, a town of Yugoslavia, 60 miles S. of Nish, with important iron-works, was captured by Bulgarians during the Great War; pop. 12,000.

Vratca (also VRATTSA, WRATZA), a town of Bulgaria, 38 miles NNE. of Sofia, the seat of a bishop, is a busy industrial centre for wine, silk, &c.; pop. 16,000. The *district* has an area of 2649 sq. m. and a pop. (1926) of 392,410.

Vrchlický, JAROSLAV (EMIL FRIDA, 1853–1912), Czech poet. See CZECHOSLOVAKIA, *Literature.*

Vries, DE. See DE VRIES.

Vriesland. See FRIESLAND.

Vršac (Hung. *Versecz*), a town of Yugoslavia, about 45 miles NE. of Belgrade, with a brisk trade, especially in wine and brandy; pop. (1921) 26,975.

Vryburg, capital of British Bechuanaland, near a head-stream of the Vaal River, 145 miles N. of Kimberley by rail; pop. 2500.

Vryheid, a town of Natal, 80 miles NE. of Ladysmith. With the district of the same name it was transferred to Natal from the Transvaal in 1903. Pop. 2000.

Vulcan, the old Italian god of fire, confounded with the Greek Hephæstus (q.v.).

Vulcanised Fibre. See CELLULOSE.

Vulcanite. See INDIA-RUBBER.

Vulcano. See LIPARI ISLANDS.

Vulgate, the edition of the Latin Bible which, having been sanctioned by the usage of many ages in the Roman Church, was pronounced 'authentic' by the Council of Trent. The name was originally given to the 'common edition' of the Septuagint used by the Greek Fathers, and thence transferred to the 'Itala' or the 'Old Latin' version of both Old and New Testaments current during the first centuries in the Western Church. It finally passed to the present composite work, which gradually took the place of the 'Old Latin.' The relation of the component parts of this venerable version to the original texts will be best understood by a description of the work of St Jerome, from whose hand it mainly proceeded. In the time of Pope Damasus, towards the end of the 4th century, the text of the 'Old Latin,' the origin of which is lost in obscurity, had fallen into considerable confusion. It was a very literal representation of the Greek, rude in style and full of provincialisms. Every one, it seems, who had a smattering of Greek thought fit to make alterations; and so great became the variety of recensions that it is still a matter of dispute whether there were not at their basis a number of independent translations rather than a single version often retouched. To remedy the evil Jerome, at the request of Damasus, 382 A.D., undertook a revision of the New Testament. He corrected the gospels thoroughly, though with great caution, and the rest more cursorily, with the aid of Greek codices which were then reputed ancient and trustworthy. The critical value of the result as a primary witness to the Greek text in its best state in the 4th century has been generally recognised. Jerome next turned his attention to the Psalms. He at first merely corrected the Latin from the 'common edition' of the Greek, and this revision, called the 'Roman Psalter,' completed in 383, was introduced by the pope into the Roman liturgy, and is to this day used in the Ambrosian or Milan rite and in St Peter's at Rome. Shortly afterwards Jerome made a more thorough revision by the aid of Origen's Hexapla; and it is this, the so-called 'Gallican Psalter,' which is now read in the Vulgate. The rest of his revision of the 'Old Latin' does not concern us here, as it forms no part of the present Vulgate, and indeed has, with the exception of the Book of Job, entirely perished. After the death of Damasus Jerome was induced by the urgency of private friends to undertake a more serious task, a new translation of the Old Testament from the Hebrew. This he accomplished in Palestine, where he had perfected himself in Hebrew with the assistance of learned Jews, during the years 390–405 A.D. To this work he added a free translation of the books of Tobit and Judith from the Chaldee version of the original Hebrew, now lost. The other books of the Greek canon, afterwards incorporated with the rest of his work—viz. Wisdom, Ecclesiasticus, and Maccabees—were left by him untouched; and these, with, in a somewhat less degree, the Psalms and the New Testament, are of especial value to the linguist, preserving as they do, quite apart from their Grecisms, many lexical and grammatical forms, relics of the dialect of the people, which are not found in the classical or literary language. The new translation met at first with much opposition. The Fathers had been accustomed to regard the Septuagint as an inspired version, and Jerome's departure from that version appeared to be a dangerous innovation. It won its way by degrees, and by force of its intrinsic worth. Gregory the Great says that in his time the Roman see made use of both versions. Venerable Bede speaks of St Jerome's as '*our* edition;' and soon the 'Old Latin' fell into disuse and neglect, so that, notwithstanding the keen researches of scholars, a complete copy of the pre-Hieronymian Old Testament cannot now be made up from the surviving fragments.

In the course of the middle ages the Vulgate necessarily contracted some corruption. Charlemagne, with the aid of Alcuin, took pains to procure and disseminate a pure text; and later on, with the same object, the university of Paris and some of the religious orders compiled *Correctoria*, or lists of common errors with their corrections. The numerous editions printed in the 15th century were of no critical value, but in the first half of the following century several attempts were made to provide a revised and authoritative text, the most im-

portant editions being those of R. Stephens (1528, and later) and of the Louvain theologians (first under the care of Henten of Malines in 1547, and secondly with the co-operation of Lucas of Bruges and the printer Plantin, 1574). Meanwhile the carrying out of the Tridentine decree, that the Vulgate should be printed as correctly as possible, was undertaken by the popes, who appointed commissions of cardinals and learned men for the purpose. Nearly forty years passed, however, before their labours were brought to a close. Sixtus V. in 1590 first issued the long-expected work, together with a bull in which he ordered this edition to be received as 'true, lawful, authentic, and unquestioned;' but he had of his own judgment made many important changes in the readings proposed by the commission, and these met with so little approval that the edition was after Sixtus' death almost immediately recalled, the work again submitted to a papal congregation for revision, and finally issued in 1592 as the authoritative text by Clement VIII. This Clementine Bible differed from the Sixtine in some 3000 readings. A few errors of the press were corrected in a second impression in 1593; and others, again, in the third and last official impression of 1598, to which standard all copies should be conformed.

The precise import of the term 'authentic' applied to the Vulgate has been much discussed by Roman theologians. It is, however, clear that the council intended to make no comparison of the Vulgate with the original texts, but, considering it to be convenient that, among the several *Latin versions* then current, one should be guaranteed as authentic—i.e. substantially representing the original, and free from all error in faith or morals—declared the Vulgate edition tested by long usage within the church to be such. The Vulgate thus defined to be an authentic version could not be the particular Clementine edition, which was not then in existence, but the Vulgate generically, or in its purest form. Although the official text is capable of improvement, it is agreed by the best judges that the Clementine editors made use of ancient manuscripts with discernment, and proceded throughout on sound critical principles. In 1907 Pius X. asked the Benedictines to undertake the first stages in revision of the Vulgate, and work began at once under Dr Gasquet (now Cardinal). The object is to recover the text of Jerome.

The best general history of the Vulgate is that of Kaulen, *Geschichte der Vulgata* (Mainz, 1868). The fullest account in English will be found in Westcott's article in Smith's *Dictionary of the Bible*. Several codices and fragments of the 'Old Latin' were published in the Benedictine Sabatier's *Vetus Italica* (3 vols. folio, Paris, 1751) and in the fine work of the Oratorian Bianchini, *Evangeliarium Quadruplex* (2 vols. folio, Rome, 1748). Many other manuscripts have been published separately by Tischendorf, E. Ranke, and others. See especially *Old Latin Biblical Texts* by Bishop John Wordsworth (1889 *et seq.*). The character of the Latinity of the pre-Hieronymian texts has been fully investigated by Rönsch, *Itala und Vulgata* (Marburg, 1869), and by Ziegler, *Lateinische Bibelübersetzungen vor Hieronymus* (1879). See also Plater and White, *Grammar of the Vulgate* (1927). The *Codex Amiatinus*, the principal manuscript of the Hieronymian Vulgate, highly valued by the Clementine editors, has been published, the New Testament by Tischendorf (Leipzig, 1854) and Old Testament by Heyse and Tischendorf (Leip. 1873). The work done by the Roman Congregations has been well brought to light by Ungarelli, *Historia Vulg. Edit.* (1847), and by Vercellone, *Dissertazioni* (1864); see also Berger's *Histoire de la Vulgate* (1893). The various readings of ancient Vulgate manuscripts were critically examined by Vercellone in his *Variæ Lectiones* (2 vols., to end of the book of Kings only, 1860-64). The variation between the Sixtine and Clementine editions have been treated controversially by Cox in his *Bellum Papale*, but more thoroughly by Bukentorp in *Lux de Luce* (1710). The imperfections of the Vulgate in relation to the original texts are emphasised by Sixtinus Amama in his *Anti-barbarus Biblicus* (1656). Of Concordances to the Vulgate, Dutripon's reached a ninth edition before the end of the 19th century.

Vulpius, CHRISTIANE. See GOETHE.

Vulture, any member of the family Vulturidæ included among the Birds of Prey in the sub-order Falcones. By some naturalists the family is subdivided into the Old-World vultures (Vulturinæ) and the New-World vultures (Sarcorhamphinæ), while by others the latter, which are distinguished by a perforated nostril and the absence of an 'after-shaft' to the feathers, are regarded as a distinct family, Cathartidæ. In all the vultures the head and neck are more or less bare, the beak is long and curved only at the tip; the legs and feet are large and powerful, but the toes and claws are relatively weak. They are thus well adapted for walking and feeding on the ground, but are unable to carry off their prey like the eagles and hawks. The wings are very strong, and their powers of swift and sustained flight are remarkable. Vultures are widely distributed throughout temperate and tropical regions, and the general habits of the various species are very similar, though they differ greatly in their choice of haunts. Thus one species frequents the rocky peaks of the Alps and another sweeps over the great plains of Africa; the King Vulture

The King Vulture (*Sarcorhamphus papa*).

dwells alone with his mate in the densest parts of the South American forests, while Pharaoh's Chickens pick up a living as street scavengers in the towns of the East. The chief food of the vultures is carrion; they rarely attack any living animal unless under great stress of hunger, when a wounded or feeble lamb or hare is sometimes killed. There has been much discussion as to whether vultures scent or sight their prey, but experiment has shown, apparently conclusively, that their sense of smell is not unusually acute, and that they rely chiefly on their extreme keenness of vision, while the sudden descent of one bird serves as a signal to many others. When a carcass is discovered by one, others arrive quickly on the scene from all points of the compass, though none may have been visible a few minutes before. Tearing off the skin with their powerful beaks they gorge themselves greedily on the flesh and entrails till nothing is left but the skull and larger bones. Smaller birds only venture to look on and watch for stray morsels which may be let fall, but in the neighbourhood of towns the vulture's claim

is sometimes—not often successfully—disputed by wandering dogs. After a full meal vultures may remain without food for many days. The young birds, which are carefully tended for several months, are fed by regurgitation of food from the crop of the parents. One of the commonest European species is the Griffin Vulture (*Gyps fulvus*), which occurs in Spain, among the Alps, and in the Mediterranean region generally, It makes a rough nest of branches and grasses, usually in a cavity or on a ledge of an almost inaccessible cliff. One or at most two eggs are laid early in March, and the parents share the labour of rearing and tending the young. The adult bird measures 3½ feet in length; the general colour is light brown with black markings, and there is a white ruff on the lower part of the neck. The Eared Vulture (*Otogyps auricularis*), an inhabitant of Africa, receives its name from folds of skin on the head resembling ear-lappets. The Egyptian Vulture (*Neophron percnopterus*) is often called Pharaoh's Chicken from its frequent occurrence in ancient Egyptian hieroglyphics, where it is used as an emblem of parental love. It is very common throughout northern Africa and Persia, and breeds frequently in the south of Europe. More than one specimen has been killed in England. The Egyptian vulture is raven-like in form; its wings are pointed, its bill slender, and half covered with a naked cere. The adult bird is little over 2 feet in length; its plumage is white with black wing-feathers. The young birds are dark brown. Some account of the New-World vultures will be found in the article CONDOR.

Egyptian Vulture (*Neophron percnopterus*).

Vulturnus (mod. *Volturno*), a river of Campania, on whose banks stood the city of *Vulturnum* —both names that often occur in Roman history.

Vyasma, a town of Russia, 110 miles ENE. of Smolensk by rail, with a 16th-century cathedral, some industries, and a pop. of 31,000.

Vyatka, a Russian town on the river Vyatka, 280 miles NE. of Nijni-Novgorod. There are manufactures of leather, and an active trade in corn. Pop. 52,000.

Vyernyi (or ALMATA), a town of the Cossack (or Kirghiz) Republic in Asiatic Russia, about halfway (50 miles) between the river Ili and Lake Issig Kol. It is the centre of an agricultural district. Earthquakes occur. Pop. 47,400.

Vyrnwy, a river which rises on the borders of Merioneth and Montgomery and joins the Severn 8½ miles above Welshpool. By engineering operations in 1881–92 the waters of the Upper Vyrnwy were impounded for the water supply of Liverpool. By the track the water follows, the distance is 68 miles. See WATER (*Water Supply*).

W

the twenty-third letter in the English and some other modern alphabets, is a mediæval addition to the Roman alphabet. It originated from the practice, adopted by Latin writers from about the 5th century, of doubling the letter U or V to denote the devocalised *u* (= English *w* in *way*, or French *ou* in *oui*), occurring in Germanic and Celtic proper names. Although in early Latin this was the sound of v when used as a consonant, it had ceased to exist in late Latin, where the consonantal v or u was pronounced as *v* in *vine*. When Latin characters were applied to the writing of Old English, the sound of *w* was expressed by uu; but this symbol soon fell into disuse, being superseded by the letter ƿ (called *wyn*) adopted from the Runic alphabet. This letter continued to be used by some scribes down to the end of the 13th century; but from about 1200 A.D. we find the ligatured uu, adopted from Norman-French. In early German MSS. the *w* sound was denoted by uu (uv, vu, vv), and from the 10th century onwards the letters were usually ligatured. The ligature, both in England and on the Continent, gradually came to be regarded as a letter, and assumed a variety of forms, some of which have little or no resemblance to the interlaced vv or uv out of which they were developed. In the 14th and 15th centuries the most frequent English form resembles *lk*, for which it has sometimes been mistaken by editors. In German and English black-letter printing certain 15th-century forms of the letter were preserved, and on the introduction of the roman characters in the 16th century the type W, w, was invented. This character is obviously composed of two V's joined at the top, while the small italic form now usual is composed of *u* and *v*. In some English books of the 16th century, printed abroad or from foreign types, VV was substituted for W.

In English the letter has retained its original sound. It continues to be written in several words, as *write*, *two*, in which it is no longer pronounced. It also occurs as the second component of vowel digraphs, as in *law*, *new*, *now*. (With regard to the interchange of function between *v* and *w* in early Scottish writings, see the article V.) The combination *wh*, which in Middle English spelling was substituted for the earlier *hw*, was originally pronounced as *h* followed by a voiceless *w*. This is still the pronunciation in Scotland; in South Britain *wh* is often pronounced as a voiceless *w*, but more commonly the distinction between *wh* and *w* is lost. In *who* the original *wh* sound has become *h*; in *whole* (formerly *hole*) the standard pronunciation is unchanged, but the spelling represents a dialectal alteration which obtained a temporary vogue.

In the continental Germanic languages the original sound of *w* has changed to *v*. In German and Dutch the changed sound is written w, but in the modern spelling of the Scandinavian languages v is used instead. In Polish and Bohemian w is pronounced as in German.

In Welsh the letter stands for the vowel *u* (as in English *rūle*, *pŭt*), but before a vowel it is usually sounded like the English *w*.

In Italian, Spanish, and Portuguese w is not recognised as belonging to the native alphabet, and is used only in foreign proper names. In French, on account of the many words adopted from German and English, it has been adopted into the modern alphabet, and is variously pronounced as *v* or as *w*, according to the etymology of the words in which it occurs.

In German the name of the letter is *we*, on the analogy of other letters. The English name 'double u' goes back to the time when w was still regarded not as a letter but as a ligature. In French, as the letter was not adopted till after the recognition of v as a separate letter, it is named 'double v.'

Waadt. See VAUD.

Waagen, DR GUSTAV FRIEDRICH, a well-known art-critic, was born at Hamburg in 1794, and died at Copenhagen, 15th July 1868.

Waal, an arm of the lower Rhine (q.v.).

Waals, JOHANNES DIDERIK VAN DER (1837–1923), Dutch physicist, born at Leyden, was professor of physics at Amsterdam (1877–1907), and in 1910 was awarded the Nobel Prize for research work in his own special subject.

Wabash, capital of Wabash county, Indiana, on the Wabash River, 89 miles by rail NNE. of Indianapolis, is an important industrial and agricultural centre; pop. (1920) 9872.—The Wabash River rises in western Ohio, flows across Indiana, then turns south and separates it for 200 miles from Illinois, and falls into the Ohio River after a course of 550 miles. The Wabash and Erie Canal, which also passes the town, is 476 miles long and runs from Toledo, Ohio, to Evansville, Indiana.

Wace (there is no authority for the prænomen Robert), a celebrated Anglo-Norman poet, born in Guernsey most probably about 1100, enjoyed the favour of the Norman kings of England, was given by Henry II. a prebend at Bayeux, and died about 1175. His two long romances, the *Geste des Bretons* or *Brut* and the *Roman de Rou*, are among the best monuments of Norman French in point of language, and even literature. The former (ed. by Leroux de Lincy, 2 vols. Rouen, 1836–38) is a free versification of the history of Geoffrey of Monmouth. The *Roman de Rou* is a history of the Dukes of Normandy down to 1107, three-fourths of its 16,000 verses written in octosyllabic verse rhyming in pairs (ed. by Pluquet, Rouen, 1824; more adequately by Dr Hugo Andresen, 2 vols. Heilbronn, 1877–79). See J. H. Philpot, *Maistre Wace* (1926).

Wace, HENRY (1836–1924), Anglican churchman (belonging rather to the evangelical party), born in London, was educated at Marlborough, Rugby, King's College, London, and Brasenose College, Oxford, graduating in both classics and mathematics. He served curacies at St Luke's and St James's; was a leader-writer in the *Times* (1863–84), lecturer of Grosvenor Chapel, chaplain of Lincoln's Inn (1872–80), when he became its preacher; and acted as professor of Ecclesiastical History in King's College (1875–83). In 1881

he became a prebendary of St Paul's, in 1883 chaplain to the Archbishop of Canterbury and principal of King's College, in 1903 Dean of Canterbury. He was Boyle lecturer—*Christianity and Morality*—(1874–75), Bampton lecturer—*The Foundations of Faith*—(1879), and was select preacher at Cambridge (1878), at Oxford (1880–82), honorary chaplain to the Queen (1884), and chaplain-in-ordinary (1889). His name is best known as the joint-editor with Sir W. Smith of the great *Dictionary of Christian Biography* (4 vols. 1878–87), and as himself the editor of the *Speaker's Commentary on the Apocrypha* (2 vols. 1886).

Other books are *The Gospel and its Witnesses* (1883), *Some Central Points of Our Lord's Ministry* (1890), *The Bible and Modern Investigations* (1903), *Principles of the Reformation* (1910), *Some Questions of the Day* (1912, 1914).

Wacht am Rhein, DIE ('The Watch on the Rhine'), German patriotic song, the words written in 1840 by Max Schneckenburger and the music composed in 1855 by Karl Wilhelm. The song became prominent in the wars against France, 1870–71 and 1914–18.

Waco, 'the geyser city' of Texas, capital of McLennan county, on the Brazos River, crossed by a suspension bridge, 186 miles by rail NW. of Houston. It is the seat of Baylor University and other educational institutions, boasts of many warm artesian wells (104° F.), manufactures woollens and cottons, and has machine-shops and foundries. Pop. (1920) 38,500.

Wadai, a region in French Equatorial Africa, between Lake Chad and Dar-Fur, formerly a powerful native state but still semi-independent and only semi-civilised. There are some fertile oases where crops are grown, while live stock is also raised, but there are forests in the south. The capital is Abesher. Area about 170,000 sq. m.; pop. about 1,000,000.

Wadding, LUKE, historian of the Franciscan order, was born at Waterford, 16th October 1588, studied at Lisbon, became a Franciscan and professor at Salamanca. In 1618 he settled in Rome, where he founded a college of Irish Franciscans, and wrote the *Annales Ordinis Minorum* (8 vols. 1626–40; new ed. 1731–47) and the *Scriptores Ordinis Minorum*, besides editing Duns Scotus. He died 18th November 1657.

Waddington, WILLIAM HENRY, French statesman, born in Paris, 11th December 1826, was ambassador at London from 1883 to 1892. He died 13th January 1894. His widow, an American lady, published interesting reminiscences (1903, 1905).

Wade, BENJAMIN FRANKLIN (1800–78), American statesman, born at Springfield, Mass., was called to the Ohio bar in 1827, and sat in the United States Senate 1851–69. An uncompromising opponent of slavery, he disapproved of Lincoln's liberal treatment of the question, and with Winter Davis issued the 'Wade-Davis Manifesto.' See Life by Riddle (1886).

Wade, GEORGE, field-marshal, was born in 1668, obtained his first commission in the army in 1690, and rose to be lieutenant-general of the Ordnance and a member of the Privy-council. During the critical period of the pacification of the Highlands after 1715 he commanded the royal forces in Scotland, and assisted in disarming the clans; and to him is due the execution (1720–30) of the great military roads through the Highlands, some of which have continued to be the main lines of communication. He also suppressed a riot in Glasgow, and repaired Edinburgh Castle. In 1744 he commanded in the Netherlands, and returned in 1745 to be at the head of the royal forces in Yorkshire during the Rebellion. His army was the first evaded by the Pretender on his southward march. General Wade died 14th February 1748.

Wade, SIR THOMAS FRANCIS, Chinese diplomatist and scholar, was born in 1818, educated at Harrow, entered the army in 1838, and served till 1847. Chinese secretary at Hong-kong in 1855, he was attached to the missions of Lord Elgin and Sir Frederick Bruce (1857–61), became Chinese secretary to the Legation at Pekin in 1862, and in 1871 minister plenipotentiary there, being made K.C.B. in 1875. He died 31st July 1895.

Wadelai, a town on the Upper Nile, 40 miles N. of Lake Albert. Emin Pasha made it one of the fortified stations of his Equatorial Province, and at one time his principal residence.

Wadhwán, an Indian state in the Kathiawar Political Agency. Area, 236 sq. m.; pop. (1921) 37,946. The capital, Wadhwán, 110 miles NW. of Baroda by rail, has some trade and a pop. of (1921) 16,390.

Wadi, an Arabic word signifying a river, a river-course, a ravine, or valley, appears as Guadi- in Spanish river-names.

Wadi Halfa, or HALFA, a town in the extreme north of Anglo-Egyptian Sudan, on the right bank of the Nile, just below the second or great cataract. It is named from a gorge where halfa grass or Esparto (q.v.) grows.

Wadi Musa is the modern name of Petra (q.v.).

Wading-birds. See BIRDS, GRALLÆ.

Wadset, the earliest form of giving security in land in Scotland; superseded by the modern Bond and Disposition in Security. See HERITABLE.

Wager, in English law, means a promise to give money or money's worth on the happening of an uncertain event. Every contract of insurance is in the nature of a wager, but such contracts are permitted, because they serve useful purposes. Sporting wagers were enforceable at common law, unless they were of an indecent or otherwise improper character: thus, a wager on the life of Napoleon was held void, as tending to weaken the patriotism of an Englishman, and to encourage the assassination of a foreign sovereign. By an Act of 1845 all agreements by way of wagering are rendered null and void *as between the parties;* but the enactment does not apply to any subscription for a prize to be awarded to the winner in any lawful sport. Where a person employs an agent to bet for him, or to enter into transactions contrary to Leeman's act (passed to prevent gambling in shares), no action can be brought on the bet or bargain made by the agent; but if the agent pays, the principal remains liable to indemnify him. These rules apply to all wagers; but there are certain forms of agreement which are not only void but illegal. Acts were passed in 1665 and 1710 to discourage betting on games, and an Act of 1835 provided that any security given for a gambling debt shall be void, and that money paid to the holder of such security might be recovered by action. As the loser of a bet cannot be legally compelled to pay, the debt is only what is called a debt of honour; but sporting men are usually more scrupulous in paying such debts than in meeting the claims of their lawful creditors. By the criminal law penalties are imposed on persons who keep or use houses for betting purposes, and magistrates may authorise the police to break into such houses and arrest persons found therein. The Street Betting Act of 1906 imposes penalties on persons frequenting streets for the purpose of bookmaking, betting, or wagering. An Act of 1920 prohibits the printing, publishing, or circulating of advertisements or coupons of any business

for the making of ready-money bets or wagers in connection with any football game. Persons who win money by cheating at cards, &c., are liable to be indicted for obtaining money by false pretences; persons playing or betting in the street may be punished as rogues and vagabonds. See Anson, *Law of Contract*, for a clear statement of the law relating to wagers. In the law of Scotland wagers are treated as *pacta illicita*, and debts incurred by wager are not enforced. In the United States gaming contracts are in most states void, and money paid or property delivered on such considerations may generally be recovered back. In 1892 an act was passed rendering it penal to incite infants (below the age of 21), by means of circulars, advertisements, letters, telegrams, or otherwise, to bet, wager, or borrow money—the penalty being fine or imprisonment with or without hard labour. See Betting.—For Wager of Battle, see Battle.

Wages, the part of produce which goes to the labourer. The 'wages-fund' theory formulated by Mill is that as there is at any given time in a country a determinate amount of capital available for the payment of labour, therefore the average wage depends on the proportion of this fund to the number of persons who have to share in it. Ricardo's 'iron law of wages,' taken in connection with his theory of Rent (q.v.), is generally somewhat exaggerated by socialists into the doctrine that wages cannot exceed what is absolutely necessary for the maintenance of the labourer (see Lassalle); really his teaching was that the labourers cannot for any considerable time earn more than is necessary to enable their class to live in the degree of comfort which custom has rendered indispensable, and to perpetuate their race. But for the controversies on wages, reference must be made to the works cited at Political Economy, to Marx and Socialism. See also Arrestment, Capital, Labour, Master and Servant, Trade Unions, Truck-system.

Wagga-Wagga, a town of New South Wales, Australia, on the Murrumbidgee River, 70 miles NNE. of Albany, in the centre of an agricultural and gold-mining district, and has a Catholic bishop; pop. (1921) 7679.

Waghorn. See Overland Route.

Wagner, Rudolf (1805–64), German physiologist, born at Baireuth, was professor of zoology and comparative anatomy at Erlangen (1832–40) and at Göttingen (1840–64), did some important research work in embryology, and published standard text-books on zoology, physiology, &c.—Adolf Wagner (1835–1917), his son, born at Erlangen, was professor of political science at Dorpat, Freiburg, and Berlin, and wrote extensively on economic subjects, representing the historical school and supporting state-socialism.

Wagner, Wilhelm Richard, was born in Leipzig on the 22d May 1813, the youngest of nine children, and was only five months old when his father died. His mother's second marriage to the Jewish actor, Ludwig Geyer, entailed a removal to Dresden, where, at the Kreuzschule, young Wagner received an excellent liberal education. (There has now come to light a considerable amount of evidence going to prove that Geyer was not the stepfather but the actual father of the composer.) At the age of thirteen the bent of Wagner's taste, as well as his diligence, was shown by his translation (out of school hours) of the first twelve books of the *Odyssey*. In the following year his passion for poetry found expression in a grand tragedy. 'It was a mixture,' he says, 'of Hamlet and Lear. Forty-two persons died in the course of the play, and for want of more characters I had to make some of them reappear as ghosts in the last act.' Weber, who was then conductor of the Dresden opera, seems to have attracted the boy both by his personality and by his music, but it was Beethoven's music which gave him his real inspiration. From 1830 to 1833 many compositions after standard models are evidence of hard and systematic work, and in 1833 he began his long career as an operatic composer with *Die Feen*, which, however, never reached the dignity of performance till 1888—five years after Wagner's death. After some time spent in very unremunerative routine work in Heidelberg, Königsberg, and Riga (where in 1836 he married), he resolved in 1839 to try his fortune in Paris with *Rienzi*, a new opera, written on the lines of the Paris Grand Opera and with all its great resources in view. From the month's terrific storm in the North Sea, through which the vessel struggled to its haven, till the spring of 1842, when Wagner left Paris with *Rienzi* unperformed and heartsick with hope deferred, his lot was a hard and bitter one. Berlioz in similar straits supported himself by singing in the chorus of a second-rate theatre; Wagner was refused even that humble post. In 1842 *Rienzi* was accepted at Dresden, and its signal success led to his appointment as Kapellmeister there (January 1843). In the following year the *Flying Dutchman* was not so enthusiastically received, but it has since easily distanced the earlier work in popular favour. The story was suggested to his mind during the stormy voyage from Riga, and it is a remarkable fact that the wonderful tone-picture of Norway's storm-beaten shore was painted by one who till that voyage had never set eyes on the sea. In 1845 his new opera *Tannhäuser*, proved at first a comparative failure. The subject, one which had been proposed to Weber in 1814, attracted Wagner while he was in Paris, and during his studies for the libretto he found also the first suggestions of *Lohengrin* and *Parsifal*. The temporary failure of the opera led him to elaborate self-criticism and self-examination. 'I saw a single possibility before me,' he writes, 'to induce the public to understand and participate in my aims as an artist. *Lohengrin* was finished early in 1848, and also the poem of *Siegfrieds Tod*, the result of Wagner's studies in the old Nibelungen Lied; but a too warm sympathy with some of the aims of the revolutionary party (which reigned for two short days behind the street barricades in Dresden, May 1849) rendered his absence from Saxony advisable, and a few days later news reached him in Weimar that a warrant was issued for his arrest. With a passport procured by Liszt he fled across the frontier, and for nearly twelve years the bitterness of exile was added to the hardship of poverty. It is this period which is mainly responsible for Wagner's polemical writings, *Art and Revolution*, *Art-work of the Future*, *Opera and Drama* (his most important work on æsthetics), *Judaism and Music*, &c., so biting in their sarcasm and often unfair in their attacks. He was a 'good hater.' He was egoistic, selfish, demanding sacrifices from others but not from himself; he was ungrateful to those who befriended him; extravagant and luxurious in his habits; callous in his dealings with women. The contrast between the artist and the man is astonishing.

In 1852 the poem of the *Nibelungen Ring* Trilogy was finished. In 1854 *Rheingold* (the Introduction or *Vorabend*) was ready, and *Die Walküre* (part i.) in 1856. But 'tired,' as he said, 'of heaping one silent score upon another, he left *Siegfried* unfinished, and turned to the story of *Tristan*. The poem was completed in 1857, and the music two years later, under the inspiration of Mathilde Wesendonk, the wife of a rich Zürich merchant. At last in 1861 he received permission to return to

Germany, and in Vienna he had the first opportunity of hearing his own *Lohengrin*. For three years the struggle with fortune seems to have been harder than ever before, and Wagner, in broken health, had practically determined to give up the unequal contest, when an invitation was sent him by Ludwig II., the young king of Bavaria. 'Come here and finish your work.' Here at last was salvation for Wagner, and the rest of his life was comparatively smooth. In 1865 *Tristan und Isolde* was performed at Munich, and was followed three years later by a comic opera, *Die Meistersinger*, the first sketches of which date from 1845. *Siegfried* (*Nibelungen Ring*, part ii.) was completed in 1869, and in the following year Wagner married Cosima, the daughter of Liszt, and formerly the wife of von Bülow. His first wife, Minna, from whom he had been separated in 1861, died at Dresden in 1866. Two important pamphlets, *On Conducting* and *Beethoven*, date from 1869 and 1870 respectively.

A theatre built somewhere off the main lines of traffic, and specially constructed for the performance of Wagner's later works, must have seemed the most impracticable and visionary of proposals in 1870; and yet, chiefly through the unwearying exertions of Carl Tausig (and after his death of the various Wagner societies), the foundation-stone of the Baireuth theatre was laid in 1872, and in 1876, two years after the completion of the *Götterdämmerung* (*Nibelungen Ring*, part iii.), it became an accomplished fact. The first work given was the entire Trilogy; and in July 1882 Wagner's long and stormy career was magnificently crowned there by the first performance of *Parsifal*. A few weeks later his health showed signs of giving way, and he resolved to spend the winter at Venice. There he died suddenly, 13th February 1883, and was buried in the garden of his own house Wahnfried at Baireuth.

Wagner's life and his individuality are of unusual importance in rightly estimating his work, because, unlike the other great masters, he not only devoted all his genius to one branch of music —the opera—but he gradually evolved a theory and an ideal which he consciously formulated and adopted, and perseveringly followed. It may be asked whether Wagner's premises were sound and his conclusions right; and also whether his genius was great enough to be the worthy champion of a cause involving such revolutions. Unless Wagner's operas, considered solely as music, are not only more advanced in style, but worthy in themselves to stand at least on a level with the greatest efforts of his predecessors, no amount of proof that these were wrong and he right will give his name the place his admirers claim for it. It is now universally acknowledged that Wagner can only be compared with the greatest names in music. His instrumentation has the advantage in being the inheritor of the enormous development of the orchestra from Haydn to Berlioz, his harmony is as daring and original as Bach's, and his melody is as beautiful as it is different from Beethoven's or Mozart's. (These names are used not in order to institute profitless comparisons, but as convenient standards; therefore even a qualification of the statement will not invalidate the case.)

His aim (stated very generally) was to reform the whole structure of opera, using the last or 'Beethoven' development of instrumental music as a basis, and freeing it from the fetters which conventionality had imposed in the shape of set forms, accepted arrangements, and traditional concessions to a style of singing now happily almost extinct. The one canon was to be dramatic fitness. In this 'Art Work of the Future,' as he called it, the interest of the drama is to depend not entirely on the music, but also on the poem, and on the acting and staging as well. It will be seen that Wagner's theory is not new. All or most of it is contained in the theories of Gluck and others, who at various periods in the development of opera consciously strove after an ideal music drama. But the times were not ripe, and therefore such music could not exert its proper influence. The twin arts of music and poetry, dissociated by the rapid advance of literature and the slow development of music, pursued their several paths alone. The attempt to reunite them in the end of the 16th century was futile, and only led to Opera (q.v.) which never needed, and therefore did not employ, great poetry. In Germany music was developed along instrumental lines until the school arrived at its culmination in Beethoven; and when an opera composer stopped to think on the eternal verities the result must always have been such a prophecy of Wagner's work as we find in Mozart's letters:

> *October*, 1781.—Verse indeed is indispensable for music, but rhyme is bad in its very nature. . . . It would be by far the best if a good composer, understanding the theatre and knowing how to produce a piece, and a clever poet, could be united in one. . . .'

Wagner's co-operation of all the arts in the music drama breaks down, however, both in practice and in theory. In practice, Wagner was first and foremost a musician; his verse is ordinary, his prose stilted, and he had the crudest ideas as to stage expression; he could not apply to the other arts the superb psychology and exquisite symbolism that characterise his music. In theory, the time element has to be considered; music moves at a much slower tempo than poetry or pure drama, while painting and architecture are purely static, and any attempt to bring all the arts into focus results either in confusion or in the predominance of one of the arts over the others. In the case of the music drama, it is music which takes the lead, and Wagner's mature style gradually becomes more symphonic (rather than dramatic). *Tristan* can well be termed a 'symphony with voices.'

Other, but comparatively unimportant, features in the Wagner music drama are, e.g., the use of the *Leitmotiv* or Leading Motive—found occasionally in Gluck, Mozart, Weber, &c., but here first adopted with a definite purpose, and the preference for mythological rather than historical subjects. But all Wagner's principles would have been useless without the energy and perseverance which directed his work, the loving study which stored his memory with all the great works of his predecessors, and above all the genius which commands the admiration of the musical world.

Wagner's works show a remarkable and progressive development. *Rienzi* is quite in the grand opera style of Meyerbeer, Spontini, &c. The *Flying Dutchman* is a deliberate departure from that style, and in romantic opera strikes out for itself a new line, which, followed still further in *Tannhäuser*, reaches its stage of perfection in *Lohengrin*. From this time dates the music drama, represented in its most uncompromising form by *Tristan*, which, by the intensity of the melodic lines and by the wonderful orchestration, is the most fascinating of all. To some, however, *Die Meistersinger*, with the strong human interest of the plot and the superb contrapuntal texture of the music, makes a greater appeal. The Trilogy (*Walküre*, *Siegfried*, *Götterdämmerung*, with the *Rheingold* as introduction) is a very unequal work. It is full of Wagner's most inspired writing and most marvellous orchestration; but it is too long and too diffuse. The plot also is strangely confused and uninteresting, and fails alike as a story and as a vehicle of theories, morals, or religion. *Parsifal*, with its sacred allegory, mystic symbolism, and lofty nobility of tone, stands by itself.

The libretto and music alike are impressive, but it is a controversial point whether the purely musical qualities (removed from all outside associations, religious or otherwise) are quite as great as those of Wagner's other mature works.

SIEGFRIED WAGNER, son of Richard and Cosima Wagner, was born in 1869, studied music under Humperdinck, and devoted himself to conducting, mostly at Baireuth, and to opera-composing, but none of his works have held the boards.

The Wagner literature is enormous, ranging from immoderate enthusiasm to fanatical hatred. The fullest Life is that of Glasenapp (in Ger., 6 vols. 1894–1911; trans. 1901 *et seq.*); that of Jullien (in Fr. 1886) is good, while Dannreuther's exhaustive article in Grove's *Dictionary* is temperately written. See also books in Ger. by H. S. Chamberlain (1894; trans. 1897), Moos (on æsthetics, 1906), Koch (3 vols. 1907–18), Adler (new ed. 1923); Lives in Eng. by Hueffer (1874), Finck (1893), Ashton Ellis (founded on Glasenapp, 6 vols. 1902–08), Lidgey (1921), and Studies by Krehbiel (1891) and E. Newman (new ed. 1925); also Shaw, *The Perfect Wagnerite* (1898) and thematic analyses by Kobbé (1926); Studies in Fr. by Lichtenberger (2d ed. 1901), Schuré (5th ed. 1906), and Poirée (1922). Of Wagner's literary works (10 vols. 1871–73; new ed. 12 vols. 1911), the prose works were translated by Ashton Ellis (8 vols. 1892–1900), while the Autobiography (unreliable) appeared in 1911 (trans. 1911). Various volumes of Wagner's Correspondence with Liszt, Mathilde Wesendonk, Minna Wagner, von Bülow, &c., have appeared.

Wagram (*Deutsch-Wagram*), a village 10 miles NE. of Vienna, where, on the 5–6th July 1809 the Austrians were defeated by Napoleon (q.v.).

Wagtail, a family (Motacillidæ) and a genus (Motacilla) of Passerine birds. The family, which includes the true wagtails and the Pipits (q.v.), is distinguished from the thrushes, warblers, crows, shrikes, waxwings, and starlings by the absence of the bastard or first primary; from the finches by the slenderness of the bill; from the swallows by the slenderness of the bill and the greater length of the legs; and from the larks, probably its nearest allies, by having the tarsus scutellated only in front, and having an additional spring moult, which, however, does not extend to the quills and tail-feathers. In distribution it is almost cosmopolitan, being absent only from the Polynesian subregion. It is most abundantly represented in the Palæarctic, Ethiopian, and Oriental regions; least so in the Nearctic, only one species of wagtail entering the New World, but pipits being more represented.

The genus Motacilla, the true wagtails, includes about thirty species, of which eight are European

Pied Wagtail (*Motacilla yarrelli*).

and five British. They frequent open and well-cultivated districts, where they are found on banks of streams and ponds and in pastures. They are almost exclusively terrestrial in habits, and run gracefully and swiftly along the ground, constantly jerking the long tail up and down. Their flight is very undulatory; they have little power of song. Their food consists of insects and small molluscs. Their nests are built in holes in rocks or on the ground. The Pied Wagtail (*M. yarrelli* or *lugubris*) is from 7 to 8 inches long, and has beautifully marked white and black plumage. It is found all over the western part of Europe, and is generally distributed as a resident throughout the British Islands, visiting and nesting in the extreme north of Scotland and, sparingly however, in the Hebrides and Orkneys, and known in the Shetlands and St Kilda on its spring and autumn migrations. Although a British resident bird it is partially migratory, especially in the northern districts; even in England there is a general movement northwards in spring and southwards in autumn. It breeds in April, the nest being made of moss, dry grass and roots, and placed in a hole in a bank, wall, rock, tree, or even in an open field. The cuckoo often selects this nest as cradle for her egg. The young differs considerably from the old bird in plumage. This species was long confounded with the White Wagtail (*M. alba*), found over the whole of Europe, northern Asia, India, Burma, and North Africa, occurring not uncommonly in England, more rarely in Scotland, and very rarely in Ireland. In general habits, food, and haunts it closely resembles the pied wagtail, but it has been known to breed in the burrow of a sand-martin. The Gray Wagtail (*M. melanope* or *boarula*), the Yellow Wagtail (*M. rayi*), and the Blue-headed Wagtail (*M. flava*) are the other British species. A variety of this last occurring in Alaska is the only true wagtail found in the New World. The pied wagtail often eats the water-snail (*Limnæa truncatula*) that harbours the young stages of the liver-fluke (see FLUKE).

Wahhâbis, a puritanical sect of Moslems, whose political influence, widely felt over the Mohammedan world, centred from the beginning in Nejd in central Arabia. The aim of the founder, Mohammed ibn Abdul Wahhab (1691–1765), was to restore primitive Mohammedanism. He interpreted the Koran literally (rejecting all accretions and traditions, except those universally accepted as authoritative), disapproved the superstitious veneration of Mohammed, denounced magnificence in mosques, ceremonies, or personal attire, the use of spirituous drinks or tobacco, usury, card-playing, &c., and insisted on sexual purity, almsgiving, daily prayer, &c. The Wahhâbis, under the dynasty of Mohammed ibn Saud, spread over the whole of central Arabia, capturing Mecca and Medina, but in 1818 their power was broken up by Mohammed Ali, Viceroy of Egypt. The Wahhâbis fled to Nejd and the central deserts, in 1828 made war (unsuccessfully) with the Porte, and in 1863 extended their domain again to the Persian Gulf. Nejd later fell under the subjection of the rival dynasty, the Rashids of Jabal Shammar. In 1901 Abdul Aziz III. ibn Saud, whose youth had been spent in exile, seized the Wahhâbite capital, Riyadh, consolidated his own position, and in 1910 inaugurated a great Wahhâbi revival. In 1913 he seized el Hasa, and in 1919 was at war with the Hejaz. Jabal Shammar he annexed in 1921. He drove King Hussein into exile, occupied Taif and Mecca (q.v.) in 1924, Medina and Jedda in 1925, and in 1926 proclaimed himself king of the Hejaz, sultan of Nejd and its dependencies. The same year he convoked the first Mohammedan congress at Mecca. The emir of Asir accepted his authority a little later. Practically the whole of Arabia, except Yemen, Aden, Hadramaut, Oman, Bahrain, and Kuwait, acknowledges his rule. The number of Wahhâbis

is estimated at about 3 million, brave but fanatical. Ibn Saud has largely settled the nomad tribes into agricultural communities, and dates, hides, wheat are produced and live-stock raised. There are a considerable number of Wahhâbis in India, Patna being their main centre. They hold themselves aloof both from Shîites and Sunnites, though in faith they are substantially Sunnite.

See ARABIA, MOHAMMED, and the books there cited; also Burkhardt, *Notes on the Bedouins and Wahabys* (1834); the travels of Palgrave, Doughty, Pelly, &c.; Sir W. W. Hunter, *Our Indian Musalmans* (1871); Philby, *Heart of Arabia* (1922); Cheeseman, *In Unknown Arabia* (1926).

Wahsatch Mountains. See UTAH.

Waigatz, or VAIGATCH. See NOVAYA ZEMLYA.

Waikato, the principal river of the North Island of New Zealand, flows first into Lake Taupo, and then out of it northward to Port Waikato, 25 miles south of Manakau Harbour (length, 170 miles). By works at the Arapuni gorge it is intended to supply Auckland and its district with electricity. Between the upper Waikato, Lake Taupo, Mount Ruapehu, and the west coast lies the mountainous and picturesque 'King Country,' occupied mainly by Maoris under their king, who until 1884 resolutely opposed the survey or settlement by Europeans of the lands within their *aukati* or frontier.

Wainad. See WYNAAD.

Wainewright, THOMAS GRIFFITHS, essayist, forger, and poisoner, was born in Chiswick in October 1794. Left an orphan, he was brought up at Turnham Green by his grandfather, Dr Ralph Griffiths (1720–1803), the founder of the *Monthly Review*, and was educated under Charles Burney. He had held a commission in the Guards when, about 1820 or earlier, he took to writing tawdry art criticisms and miscellaneous articles for the periodicals, especially the *London Magazine*. He married on £200 a year, and, soon outrunning his means, first committed a forgery (1824), and then poisoned with strychnine his uncle (1829), his mother-in-law (1830), a sister-in-law (1830), and a Norfolk acquaintance at Boulogne (1831). The sister-in-law (Wainewright's wife was an accomplice in her murder) had been fraudulently insured for £18,000, but two actions to enforce payment failed; and Wainewright, venturing back from France to London in 1837, was arrested for his old forgery, and sentenced to life transportation. Even in Newgate he bragged of still holding 'the position of a gentleman,' and in Van Diemen's Land canted about 'Art and the Ideal.' There he painted portraits, ate opium, and at last died of apoplexy in Hobart hospital about 1852. The 'kind, light-hearted Wainewright' of Charles Lamb (1823) is depicted by 'Barry Cornwall' as short and fattish, 'with mincing steps and tremulous words, his hair curled and full of unguents, and his cheeks painted like those of a demirep,' a collector of richly bound works on occultism and poisoning. He is the 'Varney' of Lytton's *Lucretia*, and the 'Slinkton' of Dickens's *Hunted Down*.

See his *Essays and Criticisms*, edited, with a memoir, by W. C. Hazlitt (1880), B. W. Procter's *Autobiography* (1877), Oscar Wilde's *Intentions* (1891), and Seccombe's *Twelve Bad Men* (new ed. 1911).

Waits, originally watchmen who sounded horns, and afterwards bands of musicians and singers, especially carol-singers at Christmas time.

Waitz, GEORG, historian, born at Flensburg, 9th October, 1813, studied law and history at Kiel and Berlin, became professor at Kiel in 1842, member of the German National Assembly in 1848, and professor at Göttingen in 1849, where he formed an active school of young historians who devoted themselves especially to mediæval Germany. In 1875 he became member of the Academy in Berlin, and director of the reorganised *Monumenta Germaniæ historica*, and died 24th May 1886. To native acuteness of intellect Waitz added laborious industry, with the consequence that the permanent value of his work remains secure.

Here may merely be named *Deutsche Verfassungsgeschichte* (vols. i.–viii. Kiel, 1843–78), *Schleswig-Holsteins Geschichte* (2 vols. 1851–54), *Ueber das Leben und die Lehre des Ulfila* (1840), and *Grundzüge der Politik* (1862). Many papers of his appeared in the *Forschungen zur Deutschen Geschichte* (established 1860). Other works were on Dahlmann's *Quellenkunde zur deutschen Geschichte* (edd. 3–5), and an edition of Caroline Schelling's Letters (1871). See Steindorff, *Bibliographische Uebersicht über Georg Waitz's Werke* (1886), and Kluckhohn, *Zur Erinnerung an Georg Waitz* (1887).

Waitz, THEODOR, anthropologist, was born at Gotha, 17th March 1821, studied philology, mathematics, and philosophy at Leipzig and Jena, became a lecturer in 1844 at Marburg, and professor extra-ordinary of Philosophy in 1848, and died March 21, 1864.

His greatest work is the monumental *Anthropologie der Naturvölker* (vols. i.–iv. Leip. 1859-64; vols. v.–vi. by Gerland, 1870–71). The Anthropological Society of London published a translation of the first volume in 1863. Other works were *Grundlegung der Psychologie* (1846), *Lehrbuch der Psychologie als Naturwissenschaft* (1849), *Allgemeine Pädagogik* (1852), and a critical edition of the *Organon of Aristotle* (1844).

Waitzen (Magyar *Vácz*), a Hungarian town on the Danube, 20 miles N. of Budapest, with a cathedral on the model of St Peter's, an active trade, and a pop. of 19,400.

Wakamatsu, (1) a town of Hondo, Japan, 75 miles SW. of Sendai, with manufactures of lacquer-ware; pop. (1925) 41,952.—(2) A town of Kyushu, Japan, about 100 miles NE. of Nagasaki, with pop. (1925) 49,930.

Wakayama, a town and port of Hondo, Japan, 35 miles SSW. of Osaka, is an important trade centre for cotton, &c.; pop. (1925) 95,385.

Wake. Lykewakes were in Scotland condemned by the General Assembly in 1645 and 1701, but survived this legislation in Aberdeenshire and the Highlands. See FUNERAL RITES.

Wake, WILLIAM, Archbishop of Canterbury, was born at Blandford in Dorsetshire in 1657, studied at Christ Church, Oxford, and was successively preacher to Gray's Inn, rector of St James's, Westminster, Dean of Exeter (1701), Bishop of Lincoln (1705), and Primate (1716–37), dying at Lambeth, 24th January 1737. Of great learning and industry, he has bequeathed his name to posterity in the *Genuine Epistles of the Apostolic Fathers* (1693). He maintains the authenticity of them all; but though his preliminary dissertation may be antiquated, the translations are still excellent. In these he was aided by Dr Johann Ernst Grabe (1666–1711), a native of Königsberg, who became a chaplain of Christ Church, Oxford, and edited the *Septuagint*, a *Spicilegium* of Fathers, Justin, and Irenæus.

Wakefield, a county borough and capital of the West Riding of Yorkshire, stands on the Calder at a convergence of railways, 9 miles SSE. of Leeds, 27 SSW. of York, and 19 NW. of Doncaster. In 1888 it was constituted the seat of a bishopric—its cathedral, the fine Perpendicular parish church, which, enlarged and reconsecrated in 1329, again enlarged about 1470, and restored in 1857–86 from designs by Sir G. G. Scott, was extended in 1901–05, and has a tower and spire 247 feet high. On the nine-arch bridge over the Calder is an interesting chapel founded in 1357 by the townsmen of Wakefield, a building in the beautiful flowing Decorated

style; it was restored in 1847. At the grammar-school, chartered in 1591, and removed to new buildings on a different site in 1855, were educated Dr Radcliffe, Archbishop Potter, the Benedictine Cressy, Bentley, and H. M. Chadwick, the first two of whom were natives. George Gissing was also a native, and Charles Waterton was born at Walton Hall near by. The principal buildings are the town hall, county buildings, the corn exchange, fine art institute, Clayton hospital, and lunatic asylum. John Baliol's castle at Sandal Magna, ruined in the civil war, is now within the city. Though not the great 'clothing town' it was formerly, Wakefield still has considerable manufactures of woollens, worsteds, and hosiery, as also of agricultural implements, machinery, &c., and is an important agricultural centre. It was made a parliamentary borough in 1832, and was incorporated in 1848. Pop. (1851) 22,065; (1891) 37,269; (1921) 52,892. The chief event in the history of Wakefield is the Yorkist defeat in the Wars of the Roses (q.v.) on 30th December 1460. Opinions differ as to whether the 'Towneley Plays,' famous 15th and 16th century mystery plays, were performed at Wakefield itself, or at Woodkirk in the neighbourhood. Other points of contact with the drama are *The Pinner of Wakefield* and the *Third Part of Henry VI.*

Wakefield, a town of Massachusetts, 10 miles N. of Boston, manufacturing furniture, clothes, chemicals, &c.; pop. 15,600.

Wakefield, Edward Gibbon, born in London 20th March 1796, ran away with heiresses in 1816 and 1826 and married them. During his imprisonment for the second of these he studied colonial questions with zeal, and after his liberation assisted in the colonisation of South Australia. He exercised some influence as private secretary to Lord Durham in Canada in 1838, but is best known for his services as manager of the New Zealand Association. He was a founder of the High Church colony of Canterbury, where he died, 16th May 1862. A reprint of his *View of the Art of Colonization* appeared in 1914. See his Life by R. Garnett (1898), and Mills, *Colonization of Australia.*

Wakefield, Gilbert, divine, was born at Nottingham, 22d February 1756, and had his education at Jesus College, Cambridge, of which he became fellow. He took orders, but renounced the Anglican communion, laboured as classical tutor in dissenting academies at Warrington and Hackney, lay two years in Dorchester gaol for a so-called seditious libel in answer to Bishop Watson, for which his political friends consoled him with a gift of £5000, and died in London, 9th September 1801. He published editions of Bion and Moschus, Virgil, Horace, and Lucretius; *Christian writers of the three first centuries on the Person of Christ* (1784), left unfinished; *Inquiry into the expediency and propriety of social worship* (1791), the necessity for which he denied; *An Examination of Paine's Age of Reason* (1794); and *Silva Critica,* a collection intended to illustrate the Scriptures from the stores of profane learning (1789–95). His learning was wide, if nowhere profound or exact; his theological position was practically that of a critical Unitarian. His own *Memoirs* (1792) are uninteresting; not so his Correspondence with Fox (1813).

Wake-robin. See Arum.

Wakhan. See Badakhshan, Afghanistan.

Waking Suggestion. See Hypnotism.

Wakkerstroom, a trading town of Natal (till 1903 in the Transvaal), 85 miles NNE. of Ladysmith.

Walafrid Strabo. See Gloss.

Walata. See Biru.

Walch, Christian Wilhelm Franz, was born at Jena in 1726, in 1754 became extra-ordinary, in 1757 ordinary, professor of Theology at Göttingen, and died 10th March 1784. His name survives in the durable worth of his contributions to church history: *Gedanken von der Geschichte der Glaubenslehre* (1756), *Entwurf einer Historie der Ketzereien, bis auf die Reformation* (11 vols. 1762–85), and *Neueste Religionsgeschichte* (9 vols. 1771–83).—His father, Johann Georg Walch (1693–1775), was long professor of Theology at Jena, edited Luther's works (24 vols. Halle, 1740–52), and wrote a work of great value on the history of the religious controversies within the Evangelical-Lutheran Church (5 vols. 1730–39), and its complement, on those without that church (5 vols. 1733–36).

Walchensee, a lake of Upper Bavaria near the Austrian border, furnishes water-power by which much of Bavaria and Württemberg is supplied with electricity.

Walcheren, an island in the Dutch province of Zeeland, at the mouth of the Scheldt, containing 52,000 acres. The chief places are Middelburg, Flushing, and Campvere. One-half is meadow, the other rich arable land, well wooded to the north. Where it is not protected by natural dunes, strong dykes have been formed, that at West Kapelle being a magnificent work. The drainage-water is carried off by large sea-sluices at Middelburg and Vere. Agriculture is the principal employment. The people are chiefly Protestants. Several large artificial mounds are supposed to have been erected by the early inhabitants as places of refuge from high tides.

The *Walcheren Expedition,* one of the most disastrous failures in the history of modern warfare, was planned in 1807, when Britain, Prussia, and Russia were all in arms against France; but it was not till early in the summer of 1809 (when Napoleon, who had meantime overwhelmed Prussia, and reduced Russia to neutrality, was forcing Austria, which had joined, to succumb) that the British ministry resolved to carry it out. The plan was to send a fleet and army up the Scheldt, and attack Antwerp (the principal naval station and arsenal of the French), whose fortifications, though formidable, were much in need of repair, and whose garrison at the time only numbered about 2000 Invalides and coast-guards; while there were not more than 10,000 French soldiers in Holland. The expedition, after numberless needless delays, at last sailed on July 28, and, to the number of 37 men-of-war, 23 frigates, 115 sloops and gunboats, accompanied by transports carrying about 41,000 soldiers, reached the Dutch coast on the following day. But, instead of obeying the orders of the minister of war, Lord Castlereagh (q.v.), to advance at once in force against Antwerp, the commander-in-chief, Lord Chatham (1756–1835), Pitt's elder brother, frittered away his time in the reduction of Flushing, which was not effected till August 16, by which time the garrison of Antwerp had been reinforced by King Louis Bonaparte with the troops at his command (about 6000), and by detachments sent from France, which swelled the garrison, by August 20, to 15,000 men. About the end of August Chatham, who, as a general, was a methodical incapable, 'found himself prepared' to march upon Antwerp, but by this time 30,000 men, under Bernadotte, were gathered to its defence, and the English army was decimated by marsh-fever, so that success was not to be hoped for. However, it was judged right to hold possession of Walcheren, in order to compel the French to keep a strong force on the watch in Belgium, and, accordingly, 15,000 remained to garrison the

island, the rest returning to England; but malaria proved fatal in its ravages, and, peace having been concluded between Austria and France, this force was also recalled. Thus an excellently devised scheme, through the utter stupidity of the agent chosen by George III. to carry it out, failed in every point of consequence, and ended in a loss of 7000 men dead, and the permanent disablement of half the remainder.

Waldeck, a small republican state of Germany, lying between Westphalia and Hesse-Nassau. Till 1918 it was a principality. It included the commune of Pyrmont (a small patch between Lippe, Westphalia, Brunswick, and Hanover), which joined Prussia by plebiscite in 1922. The country of Waldeck is high-lying but poor; area, 407 sq. m.; pop. (1925) 59,153. The capital is Arolsen (pop. 2200). An arrangement by which Prussia took over all essentials of government was made in 1867, and has been renewed several times since.

Waldeck-Rousseau, Pierre Marie René (1846–1904), French lawyer and statesman, was born at Nantes, his father being a barrister of some reputation. The son was called to the bar, held various ministerial posts as a moderate republican, defended de Lesseps in 1893, and was premier of a coalition cabinet (1899–1902) which passed an important Associations Bill.

Waldenburg, a town of German Lower Silesia, 45 m. SW. of Breslau, with important manufactures of porcelain, stone-ware, glass, &c. It is in the centre of a rich coal district. Pop. 44,000.

Waldenses, a famous Christian community which originally grew out of an anti-sacerdotal movement originated by Peter Waldo of Lyons in the second half of the 12th century. A rich merchant, pious and unlearned, he caused the New Testament and a collection of extracts from the Fathers to be translated into Romaunt, and, naturally failing to find the apostolic simplicity in the ecclesiastical condition of the time, sold his movable goods for the support of the poor, and devoted himself to preaching the truth to the people by the wayside. Everywhere he found eager listeners, and was followed by groups of simple and earnest persons of both sexes who did their best, even to their dress, to carry out the apostolic ideal, loving to bear the name of the Poor Men of Lyons. The tenets ascribed to them in the earliest accounts are chiefly that oaths even in a court of justice are not allowable, that homicide is under no circumstances justifiable, that every lie is a mortal sin, that all believers are capable of priestly functions, and that the sacraments are invalidated by uncleanness of life in the officiating priest. We find at first no special doctrines that could be condemned as heretical, and even in later days, as Lea pointed out, the documents of the Inquisition constantly refer to 'heresy and Waldensianism,' the former meaning Catharism. The Archbishop of Lyons forbade them to preach, but in vain; Pope Alexander III. gave them a modified approval, but Lucius III. anathematised them at Verona in 1184, and Innocent III. at the fourth council of the Lateran in 1215. But it was impossible to compel silence, for the missionary zeal of these sincere enthusiasts was boundless, and their influence quickly grew. Alonso II. of Aragon ordered them to quit his dominions in 1194, and in southern France they became involved in the common destruction of the Albigenses, although their quarrel with the church differed from that of the latter in relating to matters of practice rather than of doctrine. But under persecution their divergences from the church naturally grew ever the greater, and we find that gradually, though never uniformly, they came to repudiate the invocation of the Virgin and saints, transubstantiation, and purgatory with all its consequences. Thus the Waldensian martyrs at Strasburg in 1212 made no distinction between laity and priesthood, while at the same time both the French and Lombardian Waldenses held that the Eucharist could be celebrated only by an ordained priest, and it was at that time still the latter only who believed it invalid if the priest was living in sin. Yet they themselves maintained a kind of order of preachers (*perfecti*), living in voluntary poverty and celibacy, in contradistinction to the ordinary *credentes*. And by some accounts there was a kind of hierarchy among the *perfecti*, a theory which gains some support from the frequent use of such terms as *majoralis*, *magnus magister*, *major*, and *minor*. Their morality was austere, and we find the very inquisitors acknowledging their chastity, sobriety, truthfulness, and industry. Their crowning offences were their paramount regard for Scripture and the unresting proselytism of their preachers, who went abroad two by two, ostensibly practising some calling, as pedlars or tinkers, but ceaselessly exhorting the faithful in sequestered places, hearing confessions, and administering absolution. Their principal seats were the slopes and fastnesses of the Cottian Alps, east in Piedmont, west in Provence and Dauphiné. After the Cathari were finally crushed they supplied the chief work that remained to the Inquisition in France. They had grown strong among the poorer class in Languedoc, with schools, a good organisation, and missionaries reputed to have skill in medicine. They next spread into Lorraine, Burgundy, Franche Comté, Narbonne, and the mountains of Auvergne. We find Bernard Gui burning them at Toulouse in 1316, and by this time persecution had done its perfect work as well in refining their piety as in completing their estrangement from Rome. Their doctrine of non-resistance made it easy to harry and confiscate their property, yet we find the victims often too poor to pay for the wood that burned them. During the years 1336–46 especially they were severely harassed; twelve were burned in front of the cathedral at Embrun in 1348. Popes Clement VI. and Urban V. stimulated the zeal of the Inquisition, and we read how the fierce inquisitor, François Borel, burned 150 at Grenoble in one day in 1393. Gregory XI. urged on the unholy work in Provence, Dauphiné, and the Lyonnais, and in 1375 the prisons were crowded with far more prisoners than could be fed, and charity was actually asked for them by the church. During the Great Schism they contrived to escape, and after the Council of Constance the Hussites engaged for a time all the energies of the church. We hear, however, of the persecutions again in 1432 and later years, and by this time, says Mr Lea, so completely had the Waldenses monopolised the field of misbelief in the public mind of France that sorcery became popularly known as *vauderie*, and witches as *vaudoises*. Sixtus IV. tried to stir up Louis XI. in vain; but Charles VIII. was more docile, and Pope Innocent VIII. was able in 1488 to organise a crusade against them in both Dauphiné and Savoy. The valley of Pragelato, Val Cluson, and Freyssinières were ravaged pitilessly with fire and sword and wholesale confiscations, many *barbes* (pastors) were burned, and in Val Louise the poor fugitives were smoked to death in their caves. Louis XII. stopped the proceedings, with consent of Pope Alexander VI., whose son Cæsar Borgia had just received the duchy of Valentinois. Their remnants continued to cherish their own faith, more or less under disguise of Catholicism, until they finally merged with the Calvinists after the Reformation.

In Italy the Waldenses had found the ground

prepared by the Arnaldistæ, or followers of Arnold of Brescia (q.v.), and Umiliati, and spread rapidly even in Milan, but especially in the valleys of the Cottian Alps, Luserna, Angrogna, San Martino, Perosa. Poor, hard-working labourers as they were, they showed throughout their history examples of constancy and quiet heroism such as the world has seldom seen. The Inquisition destroyed Catharism in Italy; Waldensianism it could not destroy. About 1312 in Luserna and Perosa, we are told, as many as 500 attended their assemblies. Popes John XXII., Urban V., and Gregory XI. urged on the persecution, yet all the terrors of fire and sword and torture could not tear them from their faith. In 1375 many of the wretched fugitives from Pragelato perished in the snow, among them as many as fifty mothers with children at the breast. Again in 1475 a bitter war of extermination began under the Duchess Yolande, regent of Savoy, and another, as has been seen, in 1488 at the instigation of Pope Innocent VIII. During the persecutions in Savoy many had found refuge in Calabria and Apulia, and about 1400 there was a larger emigration, as during the 15th century the Inquisition was virtually extinct in Naples. These outlying settlements were visited every two years by *barbes* journeying under some pretext, the distance between Pignerol and Calabria being counted twenty-five days' journey by the western coast.

The Cathari never made much way in Germany, but on the other hand the Waldenses became strong. Some were burned at Strasburg in 1212, and especially in the diocese of Passau in the second half of the same century there was much persecution. Yet by the close of the century they had become very numerous, often succeeding in escaping notice by their quietness and outward conformity. In 1392 the Archbishop of Mainz persecuted them vigorously, burning thirty-six at Bingen together. At Steyer in Pomerania, in 1397, over a hundred of either sex were burned. Yet they were not extirpated, and remained strong, especially on the confines between Austria and Moravia. In 1467 they united themselves with the famous Bohemian Brethren. The Waldensians on the French side of the Cottian Alps in 1530 opened negotiations with the Swiss and German reformers, and in 1532 a five days' synod at Chanforans in the valley of Angrogne drew up articles of agreement. The Provence congregations were persecuted pitilessly under Francis I. in 1545, twenty-two villages being burned, and 4000 persons massacred, while as many were driven into flight. In Piedmont they defended their rights with such heroism that Emanuel Philibert in 1561 was forced to grant them freedom of worship in the valleys of St Martin, Perosa, and Luserna. In 1571 they formed the 'Union of Valleys' to guard their rights against a government that could not be trusted. From May 1630 to July 1631 plague raged in these valleys and carried off over 10,000—one-half of the whole population. But still more cruel was the persecution, which seldom indeed gave a long respite, and burst out in 1655 with a ferocious brutality that called forth a significant protest from Oliver Cromwell and from Milton one noble sonnet. In 1601 the Duke of Savoy had driven as many as 500 families into exile; again in 1686 Amadeus II. with the help of French troops coerced many through terror into conversion, and drove the recusants into exile, as many as 2600 to Geneva alone, others to the Palatinate, Hesse, and Nassau. In August 1689 more than 800 of these exiles returned to their native valleys, suffering incredible sufferings on their way. Under their pastor Henri Arnaud they made a valiant struggle against the French, and were finally added to Savoy by the peace of Utrecht. The 18th century was not a favourable age for persecution, yet even at its close the Waldenses could hold no office nor real estate, nor have physicians of their own faith. Napoleon allowed their church a constitution, but this Victor Emmanuel abolished in 1814, although two years later, urged by England and Prussia, he issued a milder edict. Meantime they prospered—Colonel John C. Beckwith (1789–1862), who had lost a leg at Waterloo, through reading Dr Gilly's *Visit to the Valleys of Piedmont* (1823), settled amongst the people for the last thirty-five years of his life, marrying a peasant girl, and succeeded in establishing as many as 120 schools. At last in 1848 Charles Albert gave the Waldenses equal political and religious rights, and since that time their progress has been constant if not rapid. In 1911 they numbered in Italy some 22,500. They have a theological school at Florence.

Morland, Cromwell's emissary to Piedmont in 1658, brought back many Waldensian MSS. in Romaunt, which were lost and only rediscovered in the Cambridge University Library in 1862. (See H. Bradshaw in the *Memoirs* of Camb. Antiq. Soc., 1862, and Archdeacon Groome in *Christian Advocate and Review* for January 1863). The prose consists of translations from Scripture and the Fathers, and sermons; the finest thing in the poetry is the *Nobla Leyczon*, an exhortation to good works. Gradually the Waldenses conceived a kind of mythical idea of the continuity from primitive times of their scheme of doctrine, and naturally this compelled them to push back the origin of their community until actually they came to regard theirs as the real mother of the Reformed Churches. The origin of their name was no longer found in Peter Waldo, but in the Lat. *valles*, the valleys which had sheltered the true faith from the Apostolic age. Their historical documents were interpolated and falsified to suit the requirements of this historical theory, which indeed was long accepted by the Protestant world, and only disproved by Dieckhoff, *Die Waldenser im Mittelalter* (1851); Herzog, *Die Romanischen Waldenser* (1853); Todd, *Discourses on the Prophecies relating to Antichrist* (1840); and Maitland, *Facts and Documents of the Waldenses* (1832). See the *Bulletin de la Société d'Histoire Vaudoise* appearing yearly in Torre Pellice; and of more modern books, especially Émile Comba, *Histoire des Vaudois d'Italie* (vol. i. 1887; Eng. trans. 1889), and other works; Edouard Montet, *Histoire Littéraire des Vaudois du Piémont* (1883); K. Müller, *Die Waldenser bis zum Anfang des 14 Jahrhunderts* (Gotha, 1886); Chabrand, *Protestants des Alpes* (1886); Henry C. Lea's *History of the Inquisition of the Middle Ages* (3 vols. New York, 1887); A. Bérard, *Les Vaudois, leur Histoire du IV^e^ au XVIII^e^ Siècle* (1892); Gay, *History* (1912); and Jalla, *Histoire populaire* (1922). See the bibliographies appended to the articles in Herzog and in Holtzmann-Zöpffel.

Waldersee, Alfred, Count (1832–1904), Prussian field-marshal, born at Potsdam, took a prominent part in the Franco-Prussian War, succeeded Moltke in 1888 as chief of the General Staff, and was placed in 1900 in command of the international forces to quell the Boxer insurrection in China.

Waldo. See Waldenses.

Wales, a great peninsula in the west of the island of Britain, bounded by the Irish Sea, St George's Channel, and the Bristol Channel, and touching the (now English) counties of Cheshire, Shropshire, Hereford, and Monmouth. The area is 7363 sq. m., about a fifth larger than Yorkshire. The principality of Wales, administratively a part of England, though differing more or less widely in blood, language, national character, and religious temper, is a mountainous land, and contains Snowdon (q.v.), the highest point in South Britain; North Wales is especially picturesque. The minerals are extremely valuable, and South Wales contains some of the most important coal and iron industries in the United Kingdom. Copper, zinc, lead, tin, and

gold are also found. The physical geography, geology, climate, &c. have been already discussed at GREAT BRITAIN, where physical and geological maps will be found. For the political map, see that of England. See the articles on the several Welsh counties, and on the towns such as

	Area in Statute Acres, 1921 (Land and Inland Water).	Population in 1921.
Anglesey	176,630	51,744
Brecknockshire	469,281	61,222
Cardiganshire	443,189	60,881
Carmarthenshire	588,472	175,073
Carnarvonshire	366,005	130,975
Denbighshire	426,080	154,842
Flintshire	163,707	106,617
Glamorganshire	520,456	1,252,481
Merionethshire	422,372	45,087
Montgomeryshire	510,110	51,263
Pembrokeshire	393,003	91,978
Radnorshire	301,165	23,517
Total	4,780,470	2,205,680

Cardiff and Swansea. The population of Wales was 1,360,505 in 1881, 1,760,609 in 1901, and 2,206,712 in 1921. Between 1901 and 1911 there was a falloff of 27 per cent. in the rural population; but this tendency has recently been abated. Glamorganshire contains more than half the total population. Wales has of late years been given considerable autonomous or semi-autonomous administrative powers; the investiture of the Prince of Wales took place at Carnarvon Castle, not in England; Wales manages its own National Health Insurance and its own tuberculosis campaign; its education is in Welsh hands (1907); it has its own national library (at Aberystwyth, 1911) and its own national museum (at Cardiff, 1912). The three university colleges at Aberystwyth, Bangor, and Cardiff (Aberystwyth having been originally founded on the pence of the people) were incorporated in 1893 as the University of Wales under popular control; and the university was reconstituted in 1920, with the addition of a university college at Swansea, and given the benefit of a county penny rate. There are also theological colleges at Lampeter, &c. There has also been, during recent years, a great renaissance in Welsh literature though, on account of the influx of outsiders, the Welsh language would appear not to be holding its own in proportion to the increased population. At the census of 1901, 278,902 persons spoke Welsh only, and 615,242 both Welsh and English. At the censuses of 1911 and 1921 the proportion of persons above three years of age stated as speaking English only was 53·7 and 58·9 per cent. respectively; Welsh only, 8·5 and 6·3; English and Welsh, 35·0 and 30·8; other languages or not stated, 2·5 and 4·0 per cent. The Established Church was a part of the Church of England, with four episcopal sees (St David's, St Asaph, Bangor, and Llandaff), under the Archbishop of Canterbury. By an Act of 1914 (amended 1919) it was disestablished and partially disendowed; a new constitution was framed (1917–1922) for 'the Church in Wales;' the autonomous governing body, which holds the property, is representative of both clergy and laity, and appoints an archbishop, who must be one of the diocesan bishops; two new dioceses have recently been created (Monmouth, 1921; Brecon and Swansea, 1923). The former nonconformists, now called members of the Evangelical churches, especially the Calvinistic Methodists, Congregationalists, Baptists, and Wesleyans, are very numerous, and claim to be a large majority of the total population.

History.—The population of Wales contains Brythonic elements mixed with Goidelic and Ivernian or pre-Celtic, probably pre-Aryan (see CELTS). The Silures of Glamorgan and Brecknockshire and east to the Severn were probably Goidelic; so were the Demetæ of Dyfed or west South Wales, but more strongly Ivernian; the Gangani and Decanti of North Wales were mainly Ivernian. Between these were the Ordovices (Orddwy), Brythonic, in the Upper Severn valley. During the Roman occupation Brythonic tribes seem to have encroached on the Goidels and Ivernians; and the Brythons appear to have become largely Latinised. Christianity had been introduced before the end of the 2d century, and extended beyond Roman territory. During the Roman occupation invaders from beyond the North Sea had already given trouble; the south-east of the present England was administered by the 'Count of the Saxon Shore;' the remaining territory, where Goidels and Ivernians had to be dealt with, was under the 'Duke of the Britains,' from southern Scotland to Land's End. When the Romans had gone, the *Dux Britanniarum* was succeeded by a Gwledig, who ruled over the tribes in the whole of his district, both Brythonic, Goidelic, and Ivernian, the ruling race being Brythonic. A common name for the people of this district was introduced, meaning 'fellow-countrymen,' *Combroges*, or, in modern form, *Cymry*, which survives in the names *Cumberland* and *Cambria*. *Wales* is from *Wealas*, 'foreigners,' the name given by the Anglo-Saxon invaders to the natives of Britain (compare the German *Wälsch*, used of things Italian and French). Saxon invasions did not for some time much affect this western district; but at length disturbances in the north drove Cunedda Wledig, the ruler of the district, away from the Forth valley where his seat was. He migrated to North Wales, waged war with the Goidelic tribes and expelled them from the Dee to the Teifi, Brythonising the country, except in the north-west corner. This resisted the process for some time, but at length, before 500 A.D., became Brythonic or Welsh in language, though Goidelic and Ivernian legends and traditions long lingered there. In South Wales the Demetæ were hard pressed by the same influence, and squeezed into the modern Pembrokeshire by about 600. The Demetæ of Dyfed and the Silures of Morganwg do not appear to have been conquered, but they were Brythonised; and the Gaelic language thus disappeared from Wales. At the same time Christianity was energetically spread by Cunedda's descendants, of whom many are found in the lists of Welsh saints—e.g. St David Christianised the Ivernian (or Pictish) Menavia (now St Davids), and founded a see there. The Gwledigship, more or less reduced to a shadowy claim of over-lordship over all the tribal chiefs, remained with the descendants of Cunedda, who were princes or kings of Gwynedd, Venedotia, or North-west Wales.

In 577 Ceawlin took Bath, Cirencester, and Gloucester, and thus separated the Britons of Cornwall from those of Wales. In 655 Cadwaladr, in alliance with Penda of Mercia, was defeated, and Penda slain, by Oswiu at Winwædfield. Strathclyde and Cumberland were separated by this battle from Wales. About 720 we find Cadwaladr's grandson, Rhodri (Roderick) Maelwynawg ab Tudwal, leading the Welsh chiefs; and he kept Saxondom at bay until 754, when he died. After his death his two sons quarrelled about Anglesey, while the Welsh chieftaincies fell asunder. From 757 to 795 Offa of Mercia scourged the Welsh; in 795 was the still-remembered battle of Rhuddlan marsh; Shrewsbury and Hereford became English centres; and Offa's Dyke was built from Flintshire to the Wye. In 768 the church in Gwynedd conformed to the Roman time of keeping Easter, but remained heterodox as regards the celibacy of the clergy. During the 9th century Wales was sorely troubled with Danish invasions. It was for Wales a century of misery, in which, however, Rhodri Fawr

(Roderick the Great) succeeded in bringing all the chiefs under one head for some time. Towards the end of the century the Welsh chiefs all came successively under the protection of King Alfred, and the 10th century began quietly. Hywel Dda of Dyfed (Pembrokeshire), and probably of Powys (Upper Severn and Dee), codified the Welsh laws, based on the tribal system. The end of the 10th century was miserable; internecine strife aggravated and encouraged the attacks of the English and of the Danish sea-rovers. In 1039 Gruffydd ap Llywelyn became king of Gwynedd, and after very varying fortune became in 1055 king of all Wales, except perhaps Morganwg (Glamorganshire). When he destroyed the settlements of Edward the Confessor's Norman friends in Herefordshire, there were no reprisals, but Gruffydd submitted to King Edward. He afterwards broke the peace, and was defeated in 1063 by Harold and Tostig at Rhuddlan; Wales was vehemently attacked, and Gruffydd was murdered by his own people. Wales then submitted from sheer exhaustion.

After 1066 Welsh and English co-operated against William, but in vain; in 1070 William seized Chester; in 1071 Chester was made the centre of a palatine earldom under Hugo de Avranches, and Shrewsbury of one under Roger de Montgomery; in 1072 we find a vassal of Earl Hugh's in Rhuddlan, building Rhuddlan Castle, and Hugh de Montgomery across the Plynlimmon range, harrying north Cardiganshire, while Montgomery Castle was being built. Rival claimants to Welsh princedoms call in Norman aid, while the Black Danes are still, in 1080, invading Dyfed and Anglesey, and attacking Bangor. In 1081, by the battle of Carno (Montgomery) the rightful heirs of Gwynedd and South Wales, Gruffydd ap Cynan ap Iago and Rhys ap Tewdwr, a descendant of Roderick the Great, rescued their provinces from a usurping Trahaiarn, prince of Powys. Between 1081 and 1084 the Norman Conquest extended over Monmouthshire, Cardiff and Radnor castles were built, and William entered Wales. Under William Rufus the boundary line was pushed as far back as the Neath River in Glamorganshire, Brecknockshire (Brycheiniawg) was seized, and Earl Hugh of Chester gained a footing in Anglesey. In 1093 Rhys ab Tewdwr was killed by the Brecknock Normans, and so Pembroke and Cardigan were laid open; nothing was left but the mountain country of North-west Wales.

In 1094 a general rising took place; the castles in Gwynedd were seized; the Normans were expelled from Anglesey, and they lost Montgomery Castle; and in 1095 William Rufus marched in person as far as Snowdon, but with no success. In 1096 Monmouthshire and Brecknockshire were retaken, and the Normans by this time held only Glamorganshire and Pembroke Castle. In 1097 William led two more unsuccessful expeditions into Wales. After 1097 the tide turned; in a short time the Normans had their castles again in their hands. From 1100 onwards, under the politic Henry I., districts of country were allotted to the Welsh leaders under conditions of homage and service. Gruffydd ap Cynan growing too strong in Gwynedd among his mountains, Henry led an expedition against him in 1114, and Gruffydd was obliged to agree to a peace; Gwynedd thereafter began to prosper in agriculture, building, and wealth generally, though Gwynedd and Powys (under Cadwgan) were at strife. In South Wales, where in 1111 Henry had planted colonies of Flemings in Pembrokeshire and Gower to strengthen the Norman stations, Gruffydd ap Rhys ap Tewdwr asserted his heirship to the princedom; but though he gained some considerable successes, Wales was reduced to quietness by an expedition under Henry in 1121.

After the death of Henry I. in 1135, there was a wide-spread revolt, and the men of Gwynedd took Carmarthen. Even such districts as Radnorshire were lost by the Normans; under Stephen the royal power had ceased, and the lords marchers or border barons had become simply rival robbers. The Welsh leaders are found operating as far east as Flintshire, in Chester territory, and building a castle at Oswestry. By 1157 we find Gwynedd, under Owain, extending from Flintshire to Towyn (Merioneth); Powys, under Madoc ap Maredudd, extending far down towards Shropshire; and South Wales, under Rhys, from Aberdovey to Kidwelly; but internecine strife still continues. In 1157 Henry II. leads an expedition into Wales; Madoc of Powys assists him; Owain of Gwynedd is victorious by sea, but defeated by land, and submits; Rhys of South Wales then submits, and suffers loss of lands. Much land was distributed among Norman chiefs, and many diplomatic Norman-Welsh marriages made. Rhys ere long, deprived of sundry lands by force, rose in revolt; he maintained himself till 1162; then submitted to a strong expedition sent against him, aided by the men of Gwynedd; but in 1163 all Wales was in unanimous revolt. Henry's struggle with Becket had begun, and the Welsh expectation of the return of Arthur had become general. In 1165 an extraordinary but unsuccessful effort was made by Henry; and afterwards, being engrossed in his struggle with Becket, he treated the Welsh chiefs as ordinary feudal barons, and allowed them to fight out their own disputes. On this footing the Welsh chiefs swore homage and fealty to Henry, and Rhys of South Wales assisted him against his sons' revolt.

In ecclesiastical matters, the Welsh bishops repudiated the claims of the see of Canterbury, the see of St Davids being considered an archbishopric; but in 1203 the Welsh bishops were enjoined to obey the see of Canterbury. In 1194 Llywelyn ab Iorwerth, the rightful heir, became prince of Gwynedd, upsetting Henry's arrangements of 1170; in 1212 he, in alliance with other princes, attacked the Normans in Powys and Gwynedd, and rapidly extended his conquest during John's struggle with his barons; in 1217 he did homage to Henry III.; in 1219 he had become 'Prince of all Wales,' holding his own, and helping the barons against Henry III.; in 1238 he exacted an oath of fealty to his son Dafydd from the leaders of Wales; and he died in 1240. Dafydd was beleaguered (1245) in Snowdonia by Henry. In 1246 Dafydd was succeeded by Owain and Llywelyn ap Gruffydd, his nephews, who at first surrendered their lordships to Henry; Edward, Henry's young son, cruelly ruled over them, and a successful revolt resulted; in 1258 there was a Welsh-Scottish alliance against Henry III.: Llywelyn, who helped Simon de Montfort against Henry, obtained from Simon the fullest acknowledgment of his entire independence as 'Prince of Wales' saving the homage to the English crown, and this was confirmed by Henry even after the battle of Evesham. But Edward I., after bearing with seizures of certain lands by Llywelyn, delays in reference to homage and certain money payments, appeals to Rome and Canterbury, and an offer of homage to France, declared Llywelyn a rebel in 1276; excommunication followed; and Llywelyn was forced to submission in 1277. In 1281 he broke out again, but was killed near Builth in 1282. In 1283 his brother Dafydd was executed as a traitor. In 1283 the Statutes of Rhuddlan were passed, retaining Welsh law, modified, organising the government of Wales, and diminishing the too independent power of the Norman barons.

In 1284 Edward II. was born in Carnarvon town, and made Prince of Wales in 1300–1. For several

years there were various brief insurrections, some with French assistance. In 1400 Owain ab Gruffydd Fychan, or Owain Glyndyfrdwy, Owain of the Glen of Dee or Owen Glendower, incensed by an encroachment on the part of Lord Grey de Ruthyn, took arms. Henry IV. took the field against him in vain; in 1401 unconscionably severe proscriptive laws ('Ordinances of Wales') were passed against Welshmen: Sir Henry Percy (Hotspur), Justiciary of Chester, was put in command; Owain raided the Severn valley in 1402 as far as Leominster; Henry IV. invaded Wales, but was driven back by extraordinary storms: Owain was recognised as 'Prince of Wales' at Machynlleth in 1402. Thereafter he sided against Henry IV., and allied himself with Hotspur and others for a partition of the kingdom. Henry IV. marching against the Scots, turned aside and intercepted Hotspur marching south, defeating him near Shrewsbury, 1403. Owain, who was in South Wales at the time, was left in possession during 1404, and made an alliance with Charles VI. of France in 1405. He suffered two defeats, in Monmouth and Brecknockshire, in 1405; when French assistance arrived, it could be of little use, and retired. The English entered Wales, but were again driven back by bad weather. Owain fell back in power, and in 1415 he died in obscurity, still holding out; Rhys ab Tewdwr, his associate in the rebellion, and Rhys's brother Meredydd having been executed for treason in 1412. Meredydd's son Owain married Catherine, the widow of Henry V.; their grandson, Henry Tudor, became Henry VII., to the great delight of Wales, which now believed it saw all Myrddin's (Merlin's) prophecies fulfilled, and the British race again ruling in Britain.

By 27 Henry VIII. chap. 26 (A.D. 1536) Wales was incorporated with England, with English laws and liberties; in 1689 the lords marchers' surviving anomalous jurisdiction (with a Lord President and Council at Ludlow) was abolished; in 1831 the Welsh judiciary (Court of Great Sessions) was incorporated in the judicial system of England. During the Cromwellian struggle Wales was strongly Royalist, and at a later period Jacobite in sympathy. The most striking features of its subsequent history have been the rise of Nonconformity and its recent intellectual awakenings. For disestablishment, see the first section of this article.

See Sir John Rhŷs's *Celtic Britain;* Woodward's *History of Wales* for the mediæval history; *The Welsh People,* by Rhŷs and Brynmor Jones (1900; new ed. 1923); Sir O. M. Edwards, *Wales* (1925); E. I. Dobbins, *South Wales* (industrial: 1922); N. Edwards, *Industrial Revolution in South Wales* (1924); Prof. Tout in *Owens College Historical Essays* (1902); the valuable sketch by Prof. Lloyd in the *Eisteddfod Transactions* (1884); the Marquis of Bute's Presidential Address at Rhyl Eisteddfod, 1892; Henry Owen's *Gerald the Welshman* (London: Cymmrodorion Society); Rees's *Nonconformity in Wales;* and also the references in J. R. Green's works; Hubert Lewis's *Ancient Welsh Laws;* Stephen's *Literature of the Kymry;* John E. Southall's *Wales and her Language;* E. J. Newall, *A History of the Welsh Church* (1895). For Welsh topography may be consulted works by Pennant (ed. by Rhŷs, 1883), Borrow (1862), and Wirt Sykes (South Wales, 1882). For the early British church, see ENGLAND (CHURCH OF), and for the points in which it most notably differed from that of Rome, see EASTER. Other points on which that differed—many adhering to antiquated usages gradually dropped at Rome and elsewhere—concerned the tonsure, the combination of confirmation with baptism by presbyters, the episcopal system (not diocesan fully, but rather over one church; the metropolitan system being unknown), ordination by one bishop, and a married clergy. See the *History of Wales* by J. E. Lloyd (2 vols. 1911-13); H. Williams, *Christianity in Early Britain* (1912); J. Hartwell Jones, *Celtic Britain and the Pilgrim Movement* (1912); J. W. Willis Baird, *The Celtic Church in Wales* (1897). See also EISTEDDFOD, MADOC, REBECCA RIOTS.

LANGUAGE AND LITERATURE.—Of the surviving Celtic languages, Welsh shows by far the most vigorous signs of life. It is spoken generally in rural Wales, except in Radnorshire and parts of other border counties and of Pembrokeshire; it survives in old Welsh settlements in America; it is cultivated, chiefly as the language of their religion, by thousands of Welshmen in the large towns of England. As it is written phonetically, there are very few of its speakers who cannot also read it. According to a *Memorandum* published by the National Library of Wales in 1926, the number of weekly newspapers appearing entirely or mainly in Welsh in 1925 was 23; of other periodicals as follows: monthlies 28, bi-monthly 1, quarterlies 6, irregular 2; total 60. Abstracts of acts of parliament and other parliamentary papers having reference to Wales are published in Welsh by government, and some whole acts have been translated and published, such as the Local Government Act, 1888. Welsh is taught at the four university colleges and nearly all the intermediate schools of Wales. In Welsh-speaking districts it is now generally adopted as the medium of instruction in the lower classes of elementary schools, and to a greater or less degree as a subject of instruction in the higher standards. Where this policy has been consistently followed, as in the populous Rhondda district of Glamorganshire, the slow decline of the language has been arrested, and the census returns show a considerable increase in the number of its speakers.

The modern Welsh alphabet consists of twenty-seven letters—*a, b, c, ch, d, dd, e, f, ff, g, ng, h, i, l, ll, m, n, o, p, ph, r, s, t, th, u, w, y.* The consonants *b, d, h, l, m, n, p, ph, s, t, th* are pronounced as in English; *c* and *g* are always hard; *r* is trilled; *ch* is the Scottish *ch* in *loch; dd* is the soft *th* in *breathe; f* is the English *v, ff* the English *f; ng* is pronounced as in *sing,* though it sometimes represents the double sound of the English *ng* in *finger; ll* is produced by blowing between the tongue and upper teeth on one side—it is a voiceless unilateral *l; a, e, i, o* are pronounced as in Italian; *w* is the *w* in *wind,* or the *oo* in *book; u* is a peculiar sound approaching the English *e* in *pretty; y* has a sound approaching *i* in *fir,* except in the final syllable and in monosyllables, where it is pronounced as the Welsh *u.*

Zeuss, in his *Grammatica Celtica,* published in 1853, first proved that the Celtic group of languages belongs to the great Aryan or Indo-European family; it is now seen to be so closely related to the Italic group that philologists have no hesitation in classifying the two together as the Italo-Celtic branch. The Celtic group comprises two divisions: (1) The Q-division, including (*a*) Irish, Gaelic, Manx; (*b*) extinct continental dialects; (2) The P-division, including (*a*) Welsh, Cornish, Breton; (*b*) Gaulish. Welsh, Cornish, and Breton are derived from Ancient British in the same way that French is derived from Latin. Ancient British and Gaulish were sister languages, probably differing little from one another; in the time of Cæsar they were at least as highly inflected as Latin.

The remains of the ancient British language are scanty, consisting almost entirely of proper names of men and places. But during the Roman occupation it borrowed a large number of Latin words, which naturally underwent the same changes in course of time as words of Celtic origin; we have thus in the Latin element a considerable vocabulary in which we can trace the working of the laws of

sound-change by which British became Welsh. The most important of these laws is that of 'phonetic decay': the last syllable of every British word of more than one syllable, and many medial unaccented syllables, were lost in Welsh; thus the British name **Caratācos* became in Welsh *Caradawg*, and the Latin accusative *cīvitātem* gave the disyllable *ciwdawd*. The total loss of final syllables involved the disappearance of the British declension of nouns and adjectives; but a trace of the inflexion survived in the distinction of singular and plural. Thus while the Latin *angelus* became *angel*, the plural *angelī*, which would also be the British plural, gave *engyl* in Welsh; and while Latin *latrō* gave *lleidr*, the plural *latrōnes*, which in British would be **latrones*, gave *lladron* and the *-on* was taken for a plural ending. Hence the plural of nouns in Welsh is formed either by modification of vowels, or by the addition of terminations which represent old British stem-endings.

Initial consonant mutation, which is an outstanding feature of Welsh, as of the other modern Celtic languages, comes from the phrase being taken as the phonetic unit. As some of the above examples show, British consonants such as *t* or *c*, coming between vowels (or a vowel and a liquid) were softened, and appear in Welsh as *d* or *g*. An initial consonant might be intervocalic in a *phrase*, and would so be softened; thus the pronunciation of an initial would vary according to the nature of the ending of the preceding word. The variation persisted after the loss of the endings which originally determined it; and its phonetic origin being forgotten, its use was regularised by analogy, and reduced to grammatical rules. Besides the 'soft,' Welsh has two other mutations, the 'nasal' and 'spirant,' due to the assimilation in British of an initial explosive to the preceding final nasal or spirant of an ending now lost.

Phonetic reduction set in early in British, and the new language was fully developed in the 6th century (*Y Cymmrodor*, xxviii., 1918, pp. 27–34). In Latin, which continued to be written, British names retained their unreduced inflected forms, and appear so in inscriptions of the 5th, 6th, and 7th centuries. No inscriptions are known in British—the language of the Ogam inscriptions is primitive Irish. The oldest monument of the Welsh language is the inscribed stone in the church of Towyn, Merioneth—it is Welsh, not British, and belongs to about the middle of the 7th century. Glosses, short memoranda, and fragments of prose and verse in Welsh, dating from the 8th to the 11th century, are found between the lines and in the margins and blank spaces of old Latin manuscripts. The oldest extant manuscript book in Welsh is the *Black Book of Carmarthen*, which dates from the last years of the 12th century. But manuscripts of the 13th and 14th centuries contain copies of much older poems, including some of the reputed works of the 6th-century bards.

The *Book of Taliesin* is a manuscript of the late 13th century containing poems attributed to the 6th-century bard Taliesin. Most of them are spurious; but the 'historical poems,' which deal with persons and events of the 6th century, have every claim to be considered in substance genuine. The scribe has modernised the language, as was usual; but in many cases a word which he could not understand appears in the orthography of the 9th century. These poems consist of eulogies, elegies, and descriptions of battles (see *Y Cymmrodor*, xxviii. passim).—The *Book of Aneirin*, a manuscript of about the middle of the 13th century, contains the *Gododdin* of Aneirin (Nennius's *Neirin*), a long poem on a battle fought at Catraeth (Caturacton, Catterick) in which the Britons were routed. The stanzas have evidently been recovered from oral tradition, in which the sequence and relation of the parts had been lost. The last five pages contain a number of stanzas in the orthography of the 9th or 10th century.—The *Red Book of Hergest*, a manuscript of the late 14th century, contains poems composed of *englynion* or triplets, of which the 'Elegy on Urien' and 'The Hall of Cynddylan' (lamenting the fate of the Britons around Shrewsbury) seem too powerful to be late inventions, and may well be late transcripts of the work of Llywarch Hên in the 6th and early 7th century.—The remains of the period between the 6th and 12th centuries are meagre. Most of the above-mentioned *englynion* and several poems in the *Black Book of Carmarthen* may be referred to that period; also some in the *Book of Taliesin*: the riddle of 'The Wind,' and the great poem 'The Destiny of Britain' were probably written in the 10th century. The Laws of Howel the Good were compiled in that century; the extant copies differ much from one another; the oldest manuscript is the *Black Book of Chirk*, written about 1200.

But with the 12th century there came a great literary revival. The Mabinogion and the romances of Arthur, which had long formed the stock-in-trade of the story-teller, now crystallised and took literary shape. 'It was in the year 1145,' writes Mr Alfred Nutt (*Studies in the Legend of the Holy Grail*, p. 299), 'that Geoffrey of Monmouth first made the legendary history of Britain accessible to the lettered class of England and Continent. . . . Twenty years had not passed before the British heroes were household names throughout Europe, and by the close of the century nearly every existing literature had assimilated and reproduced the story of Arthur and his Knights.'

Welsh poetry revived in the north under the auspices of Prince Gruffudd ap Cynan, who died in 1137. His elegy by Meilir is the first great poem of the period. Meilir was followed by his son Gwalchmai, whose most remarkable poem, 'Gwalchmai's Boast,' is a curious medley which rings the changes on nature, love, and war. One of his shorter pieces was translated by Gray. His younger contemporary, Cynddelw, was the most prolific poet of the period; he is also the most difficult, being excessively fond of archaisms and of piling up resounding words with a minimum of connectives. The period of the Princes ends with the poignant elegy by Gruffudd ab yr Ynad Coch on the last Llywelyn, who fell in 1282. During the latter part of the period the system of repeating consonants and internal rhymes called *cynghanedd* was being elaborated.

The bards of the Princes sang the praises of their patrons, describing their bounteous hospitality and their warlike exploits. The bards of the 14th century carried on the tradition, using the same metres, and perfecting the *cynghanedd*, though their heroes were now only petty lordlings. The 'Elegy on Gwenhwyvar of Anglesey' by Gruffudd ap Maredudd, a threnody of great beauty, represents the highest achievement of this school of bardism. But after the loss of her independence Wales could not long resist outside influences; a new school of poetry arose under the leadership of Dafydd ap Gwilym, who flourished between 1340 and 1380. He found his inspiration in the songs of the troubadours and their imitators. He discarded the cumbrous old metres, and adopted the flowing *cywydd* metre, consisting of lines of seven syllables in rhyming couplets; but he retained the *cynghanedd*. Instead of the praise of heroes his one subject is love, though, as George Borrow has pointed out, his real interest was in nature: 'Go to, Ab Gwilym, with thy pseudo-amatory odes to Morfydd, or this or that other lady, fair or ugly;

little didst thou care for any of them. Dame Nature was thy love, however thou mayest seek to disguise the truth' (*Lavengro*, ch. xix). It is impossible to give any adequate idea of Dafydd ap Gwilym's work in a few lines; suffice it to say that, as a nature poet, he is considered by competent judges to be among the greatest who ever sang in any language.

The old metres continued in use, but for more than 200 years after Dafydd's death at least four out of every five Welsh poems were written in the *cywydd* metre. But the old subjects still engaged most of the attention of the bards, who also found some new subjects of more general interest; thus Iolo Goch, a younger contemporary of Dafydd ap Gwilym, who lived to the end of the century, wrote elegies and eulogies (including three poems to Owen Glendower), as well as poems 'To the Labourer,' 'To the Tongue,' 'To the Ship,' all in the *cywydd* metre. Early in the 15th century Siôn Kent used the *cywydd* to inveigh against the sins of the age. Most of the poetry of this century is concerned with the persons and events of the time; Guto'r Glyn, Lewis Glyn Cothi, and Dafydd Nanmor, who flourished from 1440 to 1480, may perhaps be named as the chief authors of 'historical' poems. Love poems in the manner of Dafydd ap Gwilym were written at the same time by Ieuan Deulwyn, Bedo Brwynllys, and especially Dafydd ab Edmwnd, who became the Chief Bard of Wales by winning the chair for his rearrangement of the metres about 1450. He was followed by his nephew Tudur Aled, who wrote on all the usual themes, and was considered the greatest master of *cynghanedd*. He died in 1526. After him the most gifted poet of the 16th century was Wiliam Llŷn, who died in 1580 at the age of forty-five. The last poet of this period may be said to be Edmwnd Prys, who composed a metric version of the Psalms, published in 1621, which is still used in the churches and chapels of Wales.

During the *cywydd* period very little Welsh prose appears to have been written. A new period dawns with the publication of the New Testament in 1567. The translator, William Salesbury, had a craze for restoring every Latin word into its original form, so that his Testament was unintelligible to the mass of the people. But the whole Bible, translated into standard literary Welsh by Dr W. Morgan, was published in 1588. In those years many grammars and dictionaries were published; and in 1620 a new and much improved edition of the Bible was issued, and is, with few alterations, the Bible now in use. In 1632 Dr J. Davies published his Welsh-Latin dictionary, which remained the standard work for more than 150 years. The most important poet of the 17th century is Hugh Morris, who wrote a large number of songs in accentual metres adapted for singing on popular tunes; *cynghanedd* was used as an ornament, but treated as optional. He thus led the way to the free lyrical forms of the 18th and 19th centuries. The two most important prose writers were Morgan Llwyd o Wynedd, who wrote about the middle of the century eight books in defence of the Puritans; and Charles Edwards, who published in 1671 an excellent history of the Christian religion entitled *Y Ffydd Ddi-ffuant*. With these exceptions the Welsh literature of this century consisted chiefly of translations of English theological books.

But the 18th century witnessed another revival of Welsh literature. Lewis Morris, born in 1702, became a proficient in most of the natural sciences then known, a skilled mathematician, and mineralogist. He devoted his leisure hours to the study of Welsh antiquities and literature. He instructed Goronwy Owen and other young bards in the old Welsh poetic art, and by his direction and guidance brought about the last revival of Welsh literature. Goronwy Owen, the greatest bard of this period, was born of poor parents in 1722, was educated at the Bangor grammar-school, and failed to get a curacy in Wales. Goronwy's finest work is the lament of an exile. His distinction lies in his mastery of style, in which he has scarcely been approached in Welsh poetry.

About this time a religious movement, known afterwards as the Welsh Methodist revival, took place through the instrumentality of a few earnest clergymen. Griffith Jones of Llanddowror founded 3000 schools in all parts of the country to teach the people to read the Bible in the only language they could understand. The work of these schools has since been carried on by the Sunday-schools. William Williams, Morgan Rhys, and others composed a large number of hymns in metres similar to those in use in English, and freed from the shackles of *cynghanedd;* these free metres became the ordinary form of later popular poetry. Modern Welsh literature is the joint product of the literary and religious movements of the 18th century. The literary movement preserved for it the literary language; the religious movement gave it most of its subjects, and taught the people to read.

The bards of the 19th century are exceedingly numerous; the best are Robert ap Gwilym Ddu, Dewi Wyn, Caledfryn, Eben Fardd, Ieuan Glan Geirionydd, Emrys, Nicander, Islwyn, and Ceiriog. The prose of this century is mostly theological; of purely literary works we may mention the historical works of the Rev. P. Price and Gweirydd ap Rhys, the essays of the brothers Roberts of Llanbrynmair, the works of Dr William Rees, the literary essays of Dr L. Edwards, and the novels of Daniel Owen.

The early grammars and the dictionary of Dr Davies have been mentioned. In 1707 Edward Lhuyd of Jesus College published his *Archæologia Britannica;* it contained grammars and comparative dictionaries of the Celtic dialects, and anticipated some of the discoveries of modern comparative philology. But the native philologists did not in the least understand him; and in 1803 W. Owen, afterwards Dr W. O. Pughe, published his dictionary, based philologically upon the theory that every Welsh word was an agglutination of monosyllabic roots invented by the Druids. Under the influence of this dictionary the language of the 19th century was enriched by the resuscitation of a large number of obsolete words; but its orthography was thrown into a state of confusion, from which it has only recovered in the last few years. Towards the end of the century Welsh poetry touched its nadir, and Welsh prose abounded in solecisms and English idioms. As a result chiefly of the work done in the colleges and schools, Welsh prose has regained some of its old dignity and purity of diction, and it will perhaps be held in time to come that some of the greatest Welsh poetry was written in the first quarter of this century.

One good result of the 18th-century revival was the interest which it awoke in Welshmen in their old literature. In the first years of the 19th century the *Myvyrian Archaiology*, under the editorship of Owen Jones, William Owen, and Edward Williams, was published at Owen Jones's expense. It contained the works of the early bards and historical and other works of the middle ages. A second edition was issued by Mr Gee of Denbigh in 1870. In 1838 Lady Guest published the *Mabinogion*, with translations. Subsequently the Welsh MSS. Society was formed, and the *Liber Landavensis*, and the *Lives of the Saints* were published by it. In 1868 Mr W. F. Skene published his *Four Ancient Books of Wales*, containing the text of the Book of Aneirin, the Book

of Taliesin, the Black Book of Carmarthen, and the poetry of the Red Book of Hergest (q.v.), with translations and notes. In 1887 the first volume was published of the *Welsh Texts*, under the editorship of Prof. Rhys and Mr Gwenogvryn Evans. It contains the text of the Mabinogion from the Red Book of Hergest. All the other ancient books named above have since been issued in more reliable texts in this series. During the present century the university of Wales has published reproductions of several manuscripts of poems of the *cywydd* period; and critical editions have appeared of the works of Dafydd Nanmor, Tudur Aled, and of selections of the works of Dafydd ap Gwilym, Iolo Goch, and others, prepared by members of the university.

PRINCE OF WALES is the title borne by the eldest son of the sovereign of England. After the fall of the last native princes of Wales, Llewelyn in 1282 and David in 1283, Wales came fully under the dominion of Edward I., who in 1284 is fabled to have presented the Welsh with a prince in his infant son, Edward, really born at Carnarvon Castle. Edward, by the death of his elder brother four months later, became heir-apparent; but it was not till 1301 that he was created Prince of Wales. Edward III. in 1343 invested his son Edward the Black Prince with the principality, and from that time the title of Prince of Wales has been borne by the eldest son of the reigning king. Till the time of Charles II. the Welsh connection was oddly maintained by the arrangement that the Prince of Wales always had a Welsh wet-nurse. The title is not inherited, and has usually been bestowed by patent and investiture, though in a few instances the heir to the throne has become Prince of Wales simply by being so declared. The eldest son of the sovereign is by inheritance Duke of Cornwall, a title first conferred in 1337 on Edward the Black Prince. The title of Earl of Chester, borne by Edward III. before his accession to the throne, has since been given along with the principality of Wales. On the death of a Prince of Wales in his father's lifetime the title has been conferred on the sovereign's grandson, or next younger son, being heir-apparent, though not upon Charles I. till four years after the death of Prince Henry. As heir of the crown of Scotland the eldest son of the sovereign is Great Steward of Scotland, Duke of Rothesay, Earl of Carrick, Baron of Renfrew, and Lord of the Isles.

The revenues of the Duchy of Cornwall amount to about £200,000, of which about a sixth goes to the Prince of Wales. The annuities of the Prince (from 1863 to 1901, £40,000) and Princess of Wales (in 1901, £10,000) were charged on the Consolidated Fund. The Civil List of 1910 made no provision for the Prince of Wales. The statute of treasons, 25 Edw. III., makes it treason to compass the death of the Prince of Wales or violate the chastity of his consort. By a statute of the Order of the Garter, of date 1805, the Prince of Wales as soon as he receives that title becomes a Knight of the Garter. See BADGE, ICH DIEN, REGENT, SANDRINGHAM.

Walewski, COMTE ALEXANDRE FLORIAN (1810–68), French diplomat, was born near Warsaw, a natural son of Napoleon I. and the Polish Countess Walewski. Entering the French service he was entrusted with numerous diplomatic commissions, and later filled various high official appointments.

Walfish Bay. See WALVIS BAY.

Walhalla (the German form of the Icelandic *Valhöll* or *Valhal*, 'the Hall of the Slain'—i.e. 'heroes'), the name of the place of residence for the fallen in battle in Scandinavian Mythology (q.v.).—The name WALHALLA was given to a magnificent marble structure of nearly the same proportions as the Parthenon (q.v.), erected by Ludwig I. of Bavaria (1830–41) as a temple of fame for all Germany, on an eminence 250 feet above the Danube, near Ratisbon. By means of statues, busts, reliefs, and tablets the mythology and history of Germany are illustrated, and her greatest names commemorated.

Walker, CLEMENT, was a native of Cliffe in Dorsetshire, sat for Wells in 1640, was imprisoned in the Tower by Cromwell in 1649 for writing his *History of Independency* (complete 1646–60), and died there in 1651. The work is rambling and bitter, but is worth attention.

Walker, FRANCIS AMASA (1840–97), American economist, was born at Boston, Mass., the son of Amasa Walker, author of *Science of Wealth* (1866). Francis Walker studied law, rose to the rank of general (1865) in the Civil War, superintended the censuses of 1870 and 1880, was professor of political economy at Yale (1873–81), and then president of the Massachusetts Institute of Technology. He wrote on various subjects, opposing the old theory of the 'wage fund,' and advocating international bimetallism.

Walker, FREDERICK (1841–71), artist, was born in Marylebone, studied at the British Museum, the Royal Academy, and elsewhere, and became a wood-engraver. He made drawings for various periodicals, contributed to the exhibitions of the Society of Painters in Water-colours, and became A.R.A. in 1871. See Life by Marks (1896).

Walker, GEORGE, the heroic defender of Londonderry, was born of English parents in County Tyrone in the early part of the 17th century, had his education at the university of Glasgow, took orders, and became rector of Donoughmore. When the Irish army of James II. approached Londonderry, the walls of which were untrustworthy, while the governor (Lundy) was a traitor, and the bishop (Hopkins) a timid advocate of passive obedience, the famous thirteen prentice-boys closed the city gates (18th December 1688), and the aged Walker by his fiery harangues stirred up the townspeople to make a desperate defence, the most memorable in British history. The actual siege began in April, and lasted till August 1689, a period of 105 days. The starving citizens were sustained to the last by the rousing sermons preached by Walker in the cathedral, and his heroic example at the head of sallies against the enemy. When the siege was raised Walker went to London, was warmly received at court, thanked by the House of Commons, created D.D. by Oxford, and Bishop of Derry by the king. But Walker was too impatient to settle quietly in his bishopric; he perished at the battle of the Boyne. A lofty Doric column bearing a colossal statue of Walker stands on the walls at Londonderry. Walker's *True Account and Vindication* was printed by Dwyer, with introduction and notes in *Siege of Derry* (1893).

Walker, JOHN (1674–1747), author of the *Sufferings of the Clergy*, was a native of Exeter, of which his father was mayor, and had his education at Exeter College, Oxford, where he became fellow, graduating M.A. in 1699. He became rector of St Mary-the-More, Exeter. His famous work is entitled *An Account of the Sufferings of the Clergy who were Sequestered in the Grand Rebellion* (folio, 1714). The work itself was called forth by Calamy's *Abridgment of the Life of Mr Baxter*, nearly half of which is the famous *Particular Account of the Ministers who were ejected by the Act of Uniformity*, and Calamy himself replied to it in *The Church and Dissenters compared as to Persecution* (1719). Withers, a dissenting minister of Exeter,

also made a reply, and still more Neal in his *History of the Puritans*. Walker estimates at from seven to eight thousand the number of clergy 'imprisoned, banished, and sent a-starving.' The *Sufferings of the Clergy* was reprinted by Tatham (1911).

Walker, JOHN, dictionary-maker, was born at Colney Hatch in Middlesex, 18th March 1732, was by turns actor, schoolmaster, and peripatetic teacher of elocution, passed from Presbyterianism to the Roman Catholic communion, and died in London, 1st August 1807. His well-known *Rhyming Dictionary* first appeared in 1775, and has since relieved the poetic pains of countless poetasters, and even of Lord Byron. His *Critical Pronouncing Dictionary*, published in 1791, retained its popularity for most of the 19th century.

Walker, JOHN, an Oxford antiquary, was born in 1770, became fellow of New College, Oxford, and was vicar of Hornchurch in Essex from 1819 till his death in 1831. His works were *Curia Oxoniensis; Oxoniana* (4 vols.); *Selection of Curious Articles from the Gentleman's Magazine* (3 vols. 1809); and *Letters Written by Eminent Persons* (2 vols. 1813).

Walker, JOSIAH, friend, biographer, and editor (1811) of Burns, was professor of Humanity at Glasgow, and published *The Defence of Order* (1802) and other poems.

Walker, THOMAS, was born at Manchester in 1784, son of a Liberal manufacturer, whom Erskine defended successfully on a charge of high-treason at Lancaster. He was educated privately, then went to Trinity College, Cambridge, where he graduated in 1808. He took to law, was called to the bar by the Society of the Inner Temple in 1812, became a Lambeth police-magistrate in 1829, and died at Brussels, 20th January 1836. He gave much thought to the problem of pauperism, and published a book on the subject in 1826; but his chief reputation was as a conversationalist of rare humour. His famous weekly periodical, *The Original*, ran only for twenty-six numbers, from May to 11th November 1835. His characteristic quality is seen here in the touch of humour which adds interest to themes the most ordinary.

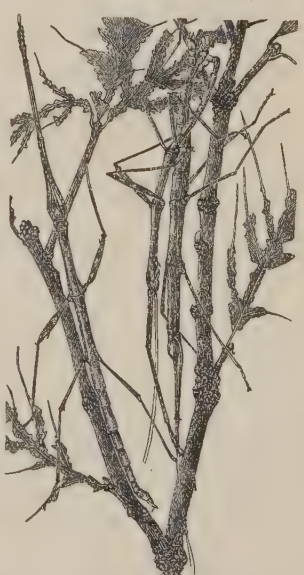
Walker, WILLIAM, filibuster, was born 8th May 1824, at Nashville, Tennessee, the son of an emigrant Dundee banker. He graduated at the university there in 1838, studied medicine at Edinburgh and Heidelberg, but soon gave this up for law and afterwards journalism at New Orleans and in California. In 1853 he failed in an attempt to conquer Sonora and to found a new republic there and in Lower California; with forty-four companions he did capture La Paz, but the native Mexicans refused to be 'liberated,' and on 8th May 1854—his thirtieth birthday—'President' Walker fought his way across the frontier into California and surrendered with the gaunt, starved, wounded survivors of his expedition to the United States commander. A trial for breaking the neutrality laws ended in his acquittal, and a year later he was on his way to Nicaragua, with fifty-five followers, invited to help the Democrats against the Legitimist party. The strange story of Walker's adventures in Central America cannot be more than outlined here. In June 1855 he was repulsed at Rivas with a loss of twenty; but in September, at the head of 110 men, he took the capital, Granada, with the loss of only a drummer. A new government was constituted, with Walker as generalissimo, and in four months he raised an American force of 1400 men, whom he kept under an iron discipline. In February 1856 Costa Rica declared war for the express purpose of driving out the foreigners; but battle and cholera thinned the ranks of the invaders, and of 3000 men only 500 escaped to carry the pestilence back with them across the border. In June Walker was elected president of Nicaragua, and his government was recognised by the United States. Walker's support came chiefly from the southern states, and his aim was to extend the area of slavery southward; accordingly almost the first act of the new administration was to restore slavery, which had been abolished in 1824. Meanwhile his enemies had gathered a force of allies from the surrounding republics, and, though he destroyed nearly 800 of them, he was compelled before the end of the year to burn and abandon Granada. Gradually the allies closed in upon him at Rivas, and on May 1, 1857, he was forced to capitulate to a United States sloop-of-war sent out for the purpose. But in November he landed again at S. Juan del Norte, with a force of 150 men—only to be compelled to surrender, in December, to a United States frigate and carried prisoner to New York, where, as his arrest on foreign soil was illegal, he was soon liberated. In 1860 he published *The War in Nicaragua*, and turned Catholic. In August he sailed from Mobile for Honduras, with a force of 100 men. He took Trujillo in half an hour, but had to evacuate it on the order of a British man-of-war, by whose commander he was given up to the Honduras authorities. By them he was tried by court-martial, and shot at Trujillo on 12th September 1860. Personally pure, temperate, honest, and fearlessly brave, Walker appears to have been led away by an unquestioning belief in his 'destiny.' See Doubleday's *Reminiscences* (1886), Roche's *Story of the Filibusters* (1891), and Scrogg's *Filibusters and Financiers* (1916).

Walker, WILLIAM SIDNEY, Shakespearian scholar, was born at Pembroke in 1795, had his education at Eton and Trinity College, Cambridge, became fellow thereof, and died, after a life far from fortunate, in 1846. His name survives through the remarkable value of his *Shakespeare's Versification* (1852) and *Critical Examination of the Text of Shakespeare* (3 vols. 1859), both edited anonymously by W. N. Lettsom. His *Poetical Remains* appeared in 1852, with a memoir by the Rev. J. Moultrie the poet.

Walking. See ATHLETICS.

Walking-leaf. See LEAF-INSECT.

Walking-stick, the popular name of many Orthopterous insects of the family Phasmidæ, which strikingly resemble the twigs of plants. The body is long and slender, the legs are also twig-like, the wings are sometimes absent, sometimes rudimentary, sometimes leaf-like. Sluggish in their habits, herbivorous in diet, the walking-sticks are very effectively concealed by their resemblance to the plants on which they rest and feed. Rossi's Stick-insect



Walking-stick (*Diapheromera femorata*).

(*Bacillus rossii*) in southern Europe, the American *Diapheromera femorata*, whose colour changes with that of the foliage, and large species of Phasma, sometimes measuring 10 inches in length, may be cited as representative. The Leaf-insects (Phyllium) are nearly related. See MIMICRY.

Walking-sticks have been in use from the remotest antiquity, not merely for helping to support the weight of the person, but for the appearance of dignity and elegance they lend. Developments from the walking-stick are the Pastoral Staff (q.v., and see FILLAN, ST), the sceptre, the constable's baton or staff, and the rod or wand of office generally (but cf. MACE). The pilgrim's staff in the middle ages was a stout stick four feet long and made hollow at the top, presumably for containing relics; but the hollow was sometimes convenient for conveying secretly valuable plants, seeds, or eggs (such as saffron and silkworm eggs), of which Chinese, Turks, and Greeks forbade the export. At a later date the tall sticks of doctors had a smaller receptacle to contain snuff or other supposed disinfectants. Magnificent and costly sticks were part of the equipment of fops in the 18th century. For the making of walking-sticks almost every kind of wood is used. Thus in England oak, ash, crab, hazel, sloe or blackthorn, broom, and juniper are favourite woods. Small stems or canes of some palms—as Malacca canes and Penang lawyers—are imported into London in large numbers; the midribs of some palm-leaves are serviceable, as are shoots of bamboo, of orange, myrtle, cinnamon, and sweet-cherry. The heads—flat, round, crooked—may be of the same piece of wood, or may be fixed on, carved or plain, made of deer's or other horn, or of ivory, silver, &c.

Walkley, ARTHUR BINGHAM (1855–1926), dramatic critic of the *Times*, was born at Bristol and educated at Warminster and at Corpus Christi, Oxford. While pursuing a successful career in the post-office department of the civil service—he was assistant-secretary from 1911 to 1919—he achieved considerable distinction in the field of dramatic criticism, to which he latterly devoted all his attentions. His principal publications are *Dramatic Criticism* (1903), *Pastiche and Prejudice* (1921), *More Prejudice* (1923), *Still More Prejudice* (1925).

Walkyries (more correctly *Valkyrjur*), in Northern Mythology, either nine or three times nine divine maidens who cleave their way through air and water to lead to Odin those who have fallen in battle and who are worthy of Valhalla.

Wall. See the relevant section under BUILDING, and articles there referred to; BUTTRESS; the articles on the various styles of architecture; and for military building, FORTIFICATION. For ancient lines of defence, see ANTONINUS (WALL OF), HADRIAN'S WALL, CATRAIL, OFFA'S DYKE, &c. Of old walled towns, retaining more or less completely their ancient walls of fortification, may be named in the British Isles Berwick, Alnwick, York, Chester, Conway, Dover, Limerick, Derry.

Wall, RICHARD (1694–1778), Spanish diplomat and statesman, was an Irishman forced, by reason of his religion, to seek service abroad. Still, in his ministerial appointments in St Petersburg, London, and Madrid, he aimed at peaceful relations with England. He retired in 1764 to an estate near Granada presented to him by the king, Charles III.

Wallaby. See KANGAROO.

Wallace, ALFRED RUSSEL (1823–1913), naturalist, traveller, and social reformer, was born at Usk in Monmouth, and (as set forth in his autobiographical *My Life*, 1905) was educated for the profession of land-surveyor and architect, a calling he exercised until 1845, when he devoted himself exclusively to studies and researches in natural history. He spent four years on the Amazon with Bates, and eight amongst the Malay Islands, making extensive zoological collections. It was while living in the East that, unaware of Darwin's cognate researches and speculations, Wallace formed and committed to writing a theory of development by natural selection, though not using the term. Valuable contributions to zoology, botany, and cognate subjects are to be found in his *Travels on the Amazon and Rio Negro* (1853); *Palm Trees of the Amazon* (1853); *The Malay Archipelago* (1869); *Contributions to the Theory of Natural Selection* (1870). In a work *On Miracles and Modern Spiritualism* (1875) he vindicates views seldom entertained by men of science; the article SPIRITUALISM in the present work is from his pen. *The Geographical Distribution of Animals* (1876) practically founded a new science; for 'Wallace's Line,' see the article GEOGRAPHICAL DISTRIBUTION. *Tropical Nature* appeared in 1878, *Australasia* in 1879, *Island Life* (1880), *Land Nationalisation* (1882), *Darwinism* (1889), *Vaccination a Delusion* (1898), *The Wonderful Century* (1898, 1903), *Man's Place in the Universe* (1904), *The World of Life* (1910). He was F.R.S., LL.D., D.C.L., and O.M., and from 1881 had a pension. *Letters and Reminiscences*, ed. by Marchant, were published in 1916, and *Life* by Hogben in 1918.

Wallace, SIR DONALD MACKENZIE (1841–1919), author, was born at Boghead, Dumbartonshire, educated at Edinburgh University, studied law in Germany, stayed six years in Russia, was correspondent for the *Times* in various European capitals, private secretary (1884–89) to two viceroys of India (Lords Dufferin and Lansdowne), and directed the foreign department of the *Times* (1890–99). He wrote standard books on Russia (1877; new ed. 1912) and Egypt (1883).

Wallace, LEWIS or LEW (1827–1905), American soldier and author, was born at Brookeville, Indiana, served in the Mexican and Civil Wars, practised law, was minister to Turkey (1881–85), and wrote the remarkably successful religious novel *Ben Hur* (1880), *The Prince of India* (1893), and other books.

Wallace, SIR RICHARD, K.C.B. (1818–90), made a baronet in 1871, inherited from his putative father, the Marquis of Hertford, a very valuable collection of paintings and other art objects, which in 1897 his widow bequeathed to the nation.

Wallace, SIR WILLIAM, the Scottish patriot, was born about 1274, the second of the three sons of Sir Malcolm Wallace of Elderslie, near Paisley, by Margaret, daughter of Sir Reginald Crawford, sheriff of Ayr. The name Wallace—otherwise Valeys, Walensis, le Waleys, &c.—means simply 'Welshman;' and the Wallaces may have come north with the Stewarts (q.v.), of whom they seem to have been feudal dependents. Blind Harry associates the hero's boyhood with Dundee, his youthful manhood with Ayrshire; whilst, according to Fordun, he got part of his education from an uncle, the priest of Dunipace, who instilled into him the maxim, 'Libertas optima rerum.' But his true history, even in the next generation, was so obscure that it now is next to impossible to separate truth from falsehood or exaggeration. He first stands out clearly in the spring of 1297 as the chief of a patriotic force, arrayed against Edward I. (q.v.) of England. To avenge, says Wyntoun, the murder of his young wife, he attacked the English garrison at Lanark and slew William de Hazelrig; he attempted to surprise the English justiciar at Scone; and with a large company he lay in the Forest of Selkirk. This

last fact (the first that is absolutely certain) appears from a letter written by Cressingham to Edward on 23d July, a fortnight before which date the Scottish nobles, with the exception of Sir Andrew Moray, had submitted at Irvine to Edward. Edward himself was at the time in Flanders, but his general in Scotland was Warenne Earl of Surrey; and him on 11th September Wallace utterly defeated in the battle of Stirling Bridge, as he was trying to pass beyond the Forth. The whole kingdom submitted to Wallace, whom we find the next month making friendly overtures to the Hanse towns of Lübeck and Hamburg, and who, crossing the Border, harried all the north of England as far south as Newcastle. (Blind Harry absurdly takes him as far as St Albans, and makes him have a meeting with the English queen, when English queen there was none.) On his return from this expedition he was appointed 'Governor of Scotland, in name of King John [Baliol], and by consent of the Scottish nation.' In 1298 Edward in person invaded Scotland at the head of 88,000 men. Wallace adopted a Fabian policy, but was forced to give battle at Falkirk (22d July), where, deserted by the cavalry, his 'schiltrouns' or circular formations of infantry were shot down by the English archers and totally routed. The Scottish loss is variously estimated by the English chroniclers at from 22,000 to 100,000, but according to Scottish writers the whole army did not exceed the former number. With this defeat Wallace's brief but glorious career terminated. We know that he visited France, whose king, Philip, came near surrendering him to Edward; we know also that he at least contemplated a visit to Rome; and then, on 3d August 1305, seven years after the battle of Falkirk, we have his capture near Glasgow by Sir John Menteith, Edward's Scottish governor of Dumbarton. He was brought to London, and, crowned with laurel in mockery, was tried for treason in the great hall of Westminster. He pleaded, and truly, that he had never been King Edward's vassal or subject; but he was condemned and executed that very same day at West Smithfield—hanged, disembowelled, beheaded, and quartered, the quarters being sent to Newcastle, Berwick, Stirling, and Perth.

See the article HARRY (BLIND) for an account of the epic which moulded, whilst embodying, the popular conception of Wallace; and for authentic materials refer in the first place to the Rev. Joseph Stevenson's *Documents illustrative of Sir William Wallace* (Maitland Club, 1841), which may be supplemented by vol. ii. of Hill Burton's *History of Scotland;* the Marquis of Bute's *Early Days of Sir William Wallace* (Paisley, 1876), his *Burning of the Barns of Ayr* (*ib.* 1878); A. Brunton's *Sir William Wallace* (Glasgow, 1881); Henry Gough's *Scotland in 1298* (Paisley, 1888); James Moir's *Sir William Wallace* (Aberdeen, 1888); the Rev. C. Rogers' *The Book of Wallace* (2 vols. Grampian Club, 1889—to be used with caution); A. F. Murison's *Sir William Wallace* ('Famous Scots,' 1898).

Wallace, WILLIAM (1844–1897), philosopher, was born at Cupar-Fife, and educated at St Andrews and Balliol College, Oxford. He succeeded T. H. Green as professor of moral philosophy, and after a career distinguished for its exposition of Hegelianism, was killed in a bicycle accident near Oxford. His chief works were *The Logic of Hegel* (1873; 2d ed. along with *Prolegomena,* 1892), *Kant* (1882), *Schopenhauer* (1890).

Wallace, WILLIAM, composer, writer, and doctor, was born at Greenock in 1860, took his M.D. at Glasgow University, specialised in ophthalmic work, and studied music at the Royal Academy, London. He has composed a symphony, several symphonic poems including *The Passing of Beatrice* (1892) and the picturesque and vivacious *Villon* (1909), and a large number of songs, many of them to original words. He has also published interesting books on æsthetics, *Threshold of Music* (1908), *The Musical Faculty* (1914), *Richard Wagner* (1925), &c., and has undertaken much propaganda work for the furthering of British music.

Wallace, WILLIAM VINCENT (1814–65), born at Waterford, of Scottish parents, early attained proficiency as a performer on the pianoforte and violin—his performances on the latter instrument bringing him under the notice of Paganini. After being for some years leader of an orchestra in Dublin, he emigrated for health's sake to Australia in 1832, and later gave concerts in New Zealand, India, and America. In 1845 he came to England and wrote his first opera, *Maritana,* which still holds the stage. Of his subsequent operas, *Lurline* (1860), produced after a residence in Germany and another visit to America, was the most popular. Wallace possessed gifts of spontaneous melody and orchestration of no mean order.

Wallachia. See RUMANIA, VLACHS.

Wallasey, a parliamentary and county borough of Cheshire, separated from Birkenhead (q.v.) by the Great Float; it comprises six townships, including New Brighton. Pop. (1921) 90,721.

Walla Walla, capital of a county of that name in Washington, on the Walla Walla River, 204 miles by rail SSW. of Spokane Falls. It has foundries and machine-shops, and is an important agricultural centre (wheat, barley, alfalfa), while stock-raising and fruit-growing are also important. Whitman Congregational College was founded here in 1859. Pop. 15,500.

Wallenstein, or more correctly WALDSTEIN, ALBRECHT WENZEL EUSEBIUS VON, Duke of Friedland, Sagan, and Mecklenburg, the most remarkable of the imperial generals in the Thirty Years' War, was born at Hermanic in Bohemia on 14th September 1583. His parents were of Czech blood, of noble rank, and Protestants, and took their name from the castle of Waldstein near Turnau. After their death the education of the boy, then fourteen, was entrusted by a Catholic uncle to the Jesuits at Olmütz. Thence he passed to the university of Altdorf; and whilst making the grand tour he spent some time studying at Padua and Bologna. Having tried his sword in battle against the Turks, he took the first step on the ladder of ambition by marrying a Bohemian widow of vast expectations. At her death (1614) he added her estates to those he had inherited from his uncle. This enabled him to raise troops to assist the Archduke Ferdinand against Venice; and he still further ingratiated himself with his future emperor through his marriage with a daughter of Count Harrach, Ferdinand's favourite. When in 1618 the Bohemians took up arms against the emperor, Count von Waldstein (to which dignity he had meanwhile been advanced) raised troops at his own cost, and led them against his countrymen. The Bohemians humiliated, Waldstein contrived to possess himself, by means the reverse of honourable, of huge slices of their confiscated estates, and in 1623 gratified another of his ambitions by inducing Ferdinand to make him ruler of the new principality of Friedland in Mecklenburg. Two years later, the emperor being hard pressed by the Protestant princes, and having no army save the troops of the Catholic League, which he could not direct as he chose, Wallenstein offered to raise and equip for his imperial master's service 20,000 men at his own expense on condition that he was given a free hand in the hostile provinces. Ferdinand jumped at the offer, and on 25th July 1625 named the wealthy Bohemian magnate general-in-chief of all the imperial armies

and conferred upon him absolute authority in the field. Wallenstein at once marched for the Elbe, and in the following spring defeated the emperor's bitter foe, Count von Mansfeld, at Dessau; in the autumn he chased him through Silesia and Hungary, and held him and his ally, Bethlen Gabor of Transylvania, in check, until Mansfeld's death and a truce with Bethlen freed Ferdinand from both these enemies. In the following year (1627) Wallenstein, co-operating with Tilly, won the Jutland peninsula and the Mecklenburg duchies from the Danes and the Protestant princes. At this time and during the next few months the emperor not only sold Wallenstein the dukedom of Sagan (in Silesia), but created Friedland a hereditary duchy, invested him with the duchy of Mecklenburg, and appointed him general of the Baltic and the North Sea.

Two objects which hovered before Wallenstein's mind at this period indicate the grandiose and wide-reaching character of his ideas: (1) the emperor should be made a despotic sovereign and head of a resuscitated empire of Byzantium, his power resting on strong and well-disciplined armies levied entirely in his own interest; (2) the power of the maritime Protestant nations of the north—Sweden, the Netherlands, England—should be broken, and the imperial sway be supreme at sea as well as on land. The latter of these ambitious dreams, which he attempted to realise by subduing Pomerania, was thwarted by the Swedish fleet and the heroic resistance of Stralsund, which, defying all Wallenstein's desperate efforts, had the honour of being the first to withstand successfully the man who believed that the stars were guiding his destiny to the loftiest heights of earthly glory. To his insatiable and unscrupulous ambition, and his greed of power, Wallenstein added an arrogance of manner, an overweening self-assurance, an arbitrary and wilful tone of behaviour, that gave the bitterest offence to Ferdinand's allies, the old princes of the empire. They, when Gustavus Adolphus invaded northern Germany, and the emperor was compelled to seek their aid against him, seized upon the opportunity to insist upon the dismissal of the 'upstart' Friedland. Contrary to Ferdinand's fears, Wallenstein quietly resigned (1630) his command and retired to Gitschin, the capital of his principality. But the inability of the Duke of Bavaria and his colleagues to check the progress of the invincible 'Snow-king' and his sheepskin-clad legions soon convinced the emperor that nothing could save him except the military genius of the man whom he had affronted. The Swedes, the Saxons, the Brandenburgers were closing in upon him; his allies were powerless to stand against them; and in the end of 1631 Ferdinand restored Wallenstein to the supreme command. But the proud and haughty duke only consented to resume action on his own terms, which practically made him absolute disposer of the military resources of the empire and supreme arbiter of peace and war. Having driven the Saxons out of Bohemia, he marched against the Swedes in Bavaria; he repulsed the desperate attempt of Gustavus Adolphus to storm his entrenched camp near Nuremberg (3d September 1632), but failed to get the better of the Swedish king at Lützen (q.v.), though his loss of the victory was more than outbalanced by the death of the mainstay of the Protestant cause.

Wallenstein's relations to the emperor, and his policy and aims, during this second investment with the supreme command were entirely different from those which had characterised his first tenure of the office. When Gustavus fell he knew perfectly well that his influence was paramount to decide the destinies not only of Ferdinand, but of the princes of the empire; he seems, therefore, to have resolved upon dictating peace to all the combatants alike, in the hope both of preserving his position as a prince of the empire and of founding a ruling (ducal or royal) dynasty. But circumstances and his own character were too strong for him. His innate love of intrigue, the ineradicable suspicion and irresolution of his nature, his impatience, his scornful pride, his instinctive predilection for mystery and crooked dealing, combined with the sudden fluctuations of circumstance, entangled him in such a complicated web of intrigue that the snarer was taken in his own toils. He sought to sow disunion amongst the Protestant princes as well as amongst the chiefs of the Catholic League; he negotiated at one and the same time with Arnim, the Saxon general, with the Swedes, with the French, with the Bohemian exiles, and hoodwinked them all and the emperor to boot; he coquetted with such bribes as the duchy of Franconia, the royal crown of Bohemia; he pretended a sincere desire to restore peace to distracted Germany; but over and above all these objects, real and professed, he aimed at keeping always a secure retreat open for himself, whatever might be the outcome of events. At length his enemies at court, pointing to his culpable inactivity after Lützen, and his open and secret negotiations with Swedes and Saxons, convinced Ferdinand that the all too powerful general was meditating treachery; and indeed in a conference with Arnim, near Schweidnitz on 16th August 1633, Wallenstein had proposed to join the Saxons and Swedes in assailing the empire, though owing to the mistrust of Arnim and of Oxenstjerna nothing came of the proposal. A month after Christmas the emperor, who had secretly won over certain of Wallenstein's officers, deposed the duke from his command and named General Gallas his successor, and in less than another month proclaimed Wallenstein a traitor, and released his officers from their oath of obedience to him. Wallenstein, thinking to find support in Bernhard of Saxe-Weimar (then on the Upper Danube), hastened to Eger in western Bohemia. But some amongst his train were traitors, notably the Irishmen Butler and Devereux, and the Scotsmen Gordon and Lesley. These men, after killing his most faithful adherents, slew Wallenstein himself as he was retiring to rest on the evening of 25th February 1634.

Tall, spare but muscular, with a yellow skin, a thin beard, and glittering eyes that made men tremble, Wallenstein was stern of countenance and cold in demeanour, of untiring activity and a lover of order, moderation, and thrift. Such were the contradictions of his strangely complex character that he was both avaricious of wealth and lavish in expenditure, obstinate yet irresolute, in general sparing of words, though on occasion rash and bold of speech, yet always cautious to a degree against committing himself in writing, unusually tolerant of religious opinions, yet a firm believer in the quackeries of astrology, impatient of control, jealous of his authority, proud and domineering, yet a far-reaching and sagacious statesman, a man consumed by the most insatiable ambition, but capable at the same time of dreaming the grandest and remotest of ideals. As a recruiter and organiser of armies, a general who could not only maintain the strictest discipline, but make himself beloved of his soldiers, and lead them to certain victory, he stands almost unrivalled. Too great for a subject, he was not great enough, or at least, consistently bold enough, to usurp the throne of a ruler; his ambition and untiring energy came to naught because he lacked resolution to fit them together for controlling the circumstances over which destiny made him master.

See Lives by Ranke (4th ed. 1880), Förster (1834), Aretin (1846), Hurter (1855), and others; monographs by Irmer (1888–89), Hallwich (1910), all in Ger.; books in Eng. by Mitchell (1840) and Toyne (1911); Förster's edition of Wallenstein's Letters (3 vols. 1828–29); Schiller's trilogy of plays; besides other works cited at THIRTY YEARS' WAR and in Schmid's *Die Wallenstein-Litteratur* (1878).

Waller, EDMUND, poet, was born of an ancient and wealthy family at Coleshill near Amersham, then in a detached portion of Hertfordshire, 3d March 1606. A maternal uncle was the father of John Hampden, and married Elizabeth Cromwell, aunt of the great Oliver, but a devoted royalist throughout. Waller had his education at Eton and King's College, Cambridge, and is usually said to have been returned member for the borough of Agmondesham (Amersham) in the parliament of 1621–22. A likelier date is 1624 for Ilchester; certainly he was returned for Chipping-Wycombe in 1625, for Agmondesham in 1627. At five-and-twenty he cut out Ann Banks, a wealthy London heiress, from the fortune-hunters about court, but she soon afterwards died, leaving him free to sing the praises of his famous Sacharissa—the beautiful Lady Dorothy Sidney, eldest daughter of the Earl of Leicester. His suit was spurned, and not more successful was his wooing of Amoret, supposed to be the Lady Sophia Murray. Long afterwards, in her old age, Sacharissa, meeting the poet one day, asked him when he would again write verses upon her: 'When you are as young, madam, and as handsome as you were then,' he replied. Waller was again returned for Amersham to the famous Long Parliament, and he seems in the great constitutional struggle to have tried the difficult task of sitting on both sides. He spoke well, and was chosen by the house to conduct the impeachment of Crawley for his judgment in the ship-money case. But his heart was with the king, and it is probable that he was gained over even before his visit as one of the commissioners to Charles at Oxford in 1643. He now plunged into a dubious plot on the king's behalf, and as soon as it was discovered was arrested and expelled the House. He showed himself an abject coward, eager to confess not only all he knew but all he suspected, and his sentence of death was commuted into a fine of £10,000 and banishment for life. He lived at Rouen, in Switzerland, and in Paris, travelled six months in company with Evelyn, and was as popular among the impoverished exiles for his hospitality as his wit. He was permitted to return in 1652. Cromwell appears to have liked to talk with him, and certainly Waller's famous panegyric is his sincerest and almost his best poem. In 1661 he sat for Hastings, and in later parliaments for Chipping-Wycombe and Saltash in Cornwall. He was ready with his congratulation, 'Upon His Majesty's Happy Return,' and, when the king complained that it was inferior to the panegyric on the Protector, replied with matchless readiness and wit, 'Poets, sir, succeed better in fiction than in truth.' Waller continued to the end a favourite at court, where his water-drinking was forgiven for his wit. He was anxious to become Provost of Eton, but as laymen were excluded by statute was hindered by Clarendon. He tried to revenge himself upon the minister in the moment of his fall, but had his reward in the elaborate character limned by the historian, in which his cowardice and meanness are gibbeted to all posterity. He died at his house at Beaconsfield, 21st October 1687, and was buried there. He left by his second wife a large family of sons and daughters.

Waller's poems, which are mostly of the *occasional* character, were widely circulated, but not published till 1645—again in 1664. His feeble character, out of place in that resolute age, is reflected in his poetry, which is easy, flowing, felicitous, but lacking in sincerity and strength. Pope has eulogised his *sweetness*, which word we may allow if we limit its meaning to elegance, ease, and grace, without passion, energy, or creative force. His importance in English poetry is that he revived the heroic couplet, and used it easily in that form which it retained for over a hundred years. Denham felt his influence most strongly, and forms the link between him and the great Dryden.

Editions of Waller are those of Fenton (1729), and Thorn Drury in 'Muses Library' (1893). See Gosse's Cambridge lectures, *From Shakespeare to Pope* (1885); but the extravagant importance given to the influence of Waller is a paradox not to be admitted. See also Julia Cartwright's *Sacharissa* (1893).

Waller, SIR WILLIAM, English general, was born about 1597, and, after military service on the Continent, became a prominent leader on the parliamentary side during the Civil War in England. He won successes over the royalists at Portsmouth, Farnham, Winchester, Hereford, and various places in the west of England, but was heavily defeated at Roundway Down (q.v.) in 1643. During 1644 he distinguished himself in the south-eastern counties, but suffered a reverse at Cropredy Bridge in June. Waller's otherwise sound generalship was limited by his inability to deal with the raw, untrained troops that he had to lead. He made the suggestion for the 'new model' army, but was unfeignedly glad when the self-denying ordinance relieved him of his military charge in 1645. Championing the political cause of the Presbyterian party, he came into dire conflict with the army, and, accused of treating with the Scots and royalists, was kept a close prisoner (1648–51). After his release he continued his efforts in the royalist cause, and spent another period in prison. He resumed his seat in parliament in 1660 and represented Westminster in the convention parliament. But he retired from political life, and died 19th September 1668. A Life of Waller is given in Wood's *Athenæ Oxonienses*, ed. Bliss, iii. 812.

Wallflower (*Cheiranthus*), a genus of Cruciferæ, having the siliques quadrangular from the prominence of the nerves on the back of the valves; the seeds are deposited in a single row in each cell, the stigma is deeply two-lobed, and the lobes are bent back. The flowers are in racemes. The species are annual, biennial, or perennial herbaceous plants, some of them almost shrubs. The Common Wallflower (*C. Cheiri*) is found in rocky places and on old walls in the south of Europe, and also, but less abundantly, in the middle of Europe and in Britain. In its wild state its flowers are always yellow; but in cultivation they exhibit a considerable diversity of colours, chiefly brown, purple, and variegated, and they attain a larger size. It is a universal favourite on account of the delicious odour of its flowers. The varieties in cultivation are very numerous, but there are among them no marked distinctions. Double and semi-double flowers are not uncommon. The plant is perennial, but in gardens is generally treated as a biennial, although fine kinds are propagated by cuttings, which soon strike root under a hand-glass. The ordinary mode of cultivation is to sow the seed of an approved kind, and to plant out the seedlings. The flowers have a bitter and cress-like taste, and were formerly used as a medicine.

Wall-fruit. See GARDENING, FRUIT, PEACH, APRICOT, &c.

Wallingford, a town of Berkshire, 15 miles NW. of Reading and 13 SSE. of Oxford, on the

right bank of the Thames. It has Roman earthworks, a fragment of a Norman castle, which figured prominently in King Stephen's wars, and was taken by Fairfax, and dismantled (1646); three—formerly thirteen—churches, in one of which Blackstone is buried; and a grammar-school. A borough since Edward the Confessor's time, it returned two members till 1832, and then one till 1885. Pop. 2724.

See Crofts' *Chronicles of Wallingford Castle* (1870), and J. H. Hedges' *History of Wallingford* (2 vols. 1882).

Wallingford, a borough of Connecticut, on the Quinepiac River, 13 miles by rail NNE. of New Haven; pop. (1920) 9648.

Wallingford, RICHARD OF (1292–1335), the 'Father of Trigonometry' in England, was born at Wallingford, Berks, and was elected Abbot of St Albans (q.v.) in 1326. He made a famous clock for the abbey, constructed the 'Albion,' an astrological instrument, and invented the 'rectangulus,' an instrument for measuring the relative positions of the heavenly bodies.

Wallis, JOHN, mathematician, was born at Ashford, Kent, 23d November 1616, was trained at Cambridge, and took orders, but in 1648 became Savilian professor of geometry at Oxford. He sided with the parliament, was secretary to the Westminster Assembly, but strenuously favoured the Restoration. His principal work is his *Arithmetica Infinitorum*, but he wrote on proportion, mechanics, the quadrature of the circle (against Hobbes), grammar, logic, theology, and the teaching of the deaf and dumb, and edited some of the Greek mathematicians. He was one of the founders of the Royal Society. He died 28th October 1703. A collected edition of his works appeared in 1791.

Wallis Archipelago (UEA), a group of islands in the Pacific Ocean, about 500 miles NE. of Fiji, administered by the French as a dependency of New Caledonia. Area, 40 sq. m.; pop. 4500.

Wallon, HENRI ALEXANDRE (1812–1904), French historian and statesman, was born at Valenciennes, succeeded Guizot in 1846 as professor of history at the Sorbonne, was elected to the Legislative Assembly (1849), but took no part in politics under the empire. He was a member of the National Assembly 1871–76, and in 1875 carried his proposition for the definite establishment of a republic (see FRANCE, p. 815).

His works include books on slavery; *Jeanne d'Arc* (1860); *Vie de Jésus* (1865), a reply to Renan; *Le Tribunal révolutionnaire de Paris* (6 vols. 1880–82); *Les Représentants du peuple* (5 vols. 1880–90).

Walloons (Fr. *Wallon*), the name given to a population akin to the French, occupying the tract along the frontiers of the Teutonic-speaking territory from Dunkirk to Malmedy. They are located more particularly in the Ardennes, in parts of Pas-de-Calais, Nord, Aisne, and Ardennes in France, but chiefly in South Brabant, Hainault, Namur, Liége, and Luxemburg, or roughly, Belgium south of the latitude of Brussels. The Walloons, whose numbers in Belgium are stated at about 3 millions, are said to be the descendants of the old Gallic Belgæ, who held their ground among the Ardennes when the rest of Gaul was overrun by the German conquerors, but became eventually Romanised, especially in their language, which is close akin to French. The name Walloon (in Dutch *Walen*) is akin to Welsh, Welsch, Wallach, &c. The Walloons of the present day resemble their French more than they do their Flemish neighbours. They are broad-headed men of Alpine race, middle-sized, with dark hair, adroit, active, impulsive, and in every way more like the French than the Flemings. They make good soldiers, and were famous as ruthless mercenaries in the Thirty Years' War (Tilly was a Walloon); and it is worthy of notice that the Belgian revolution was pre-eminently the work of the Walloon districts. It was against the Walloon spirit and tendencies that the Flemish movement (see HOLLAND, BELGIUM) was chiefly directed. During the persecutions by the Inquisition in the Low Countries bodies of Walloons fled to England, and many of the French-speaking Protestant congregations (often called 'Walloon congregations') were wholly or partly composed of Walloons (as at Canterbury, Norwich, and elsewhere).

See works on the people, dialect, and literature by Dejardin (1863), Van der Kindere (1872), Forix (1874), Le Roy (1875), Grandgagnage (1880), Demarteau (1889), Gaidoz (1890), Wilmotte (1894), Destrée (1914).

Wall-paper, a tough paper printed with a pattern in size colours. For very cheap kinds a paper of such poor quality is used that only with great care can it be pasted on walls without tearing. The commoner kinds are printed with a roller printing-machine something like that used in Calico-printing (q.v.), but the better class of wall-papers are block-printed by hand. The printing rollers or blocks are either entirely of wood, in which case the pattern is cut on their surface, or they are of wood faced with a pattern formed of felt, and outlined with thin brass fixed edgewise into the wood. Flock-paper, sometimes called velvet-paper, is made by printing the pattern in strong size, and then dusting this over with ground wool dyed various colours, and called 'flock.' The superfluous flock which does not adhere to the size is then shaken off. Flock-papers so made have a rich effect, but for some time past most of them have been prepared in one colour, and painted over after being put on the walls. In the latter case they in some degree imitate embossed leather. Such parts of a pattern as are to be finished in bronze or gold leaf are first printed in gold size. Embossed Japanese wall-papers entirely coated with bronze, but with the sunk portion of the pattern printed in colour over the bronze, are now much used in Great Britain. These are varnished, and therefore admit of being washed. The Japanese use powdered mica or talc to give paper a silvery appearance.

The modern system of paper-hanging, which is so far an imitation of the older manner of decorating walls with figured textile fabrics or embossed leather, came into use in Europe after the paper-making machine was brought into practical shape in the beginning of the 19th century. Before that paper could only be obtained in sheets of limited size, which were, however, to some extent used for covering walls after a pattern had been put on them. The Chinese appear to have used wall-papers for centuries.

In the later decades of the 19th century the patterns on wall-papers were greatly improved, some of the best decorative artists in England and France—and notably William Morris—having been frequently employed in designing them. It is hardly necessary to say that no plastered wall should be papered, except with plain cartridge-paper, until it is thoroughly dry.

See EMBOSSING; also Ward, *Wall-paper: its Origin and Manufacture* (1922); Ackermann, *Wall-paper: its History, Design, and Use* (1923); Sugden and Edmondson, *History of English Wall-papers: 1509-1914* (1926).

Wallsend, a town of Northumberland noted for its collieries, 4 miles NE. of Newcastle. It is named from its being at the end of the Roman wall (see HADRIAN'S WALL); and many Roman relics have been found here. Wallsend became a municipal borough in 1907, a parliamentary in 1918. Pop. 43,000.

Wall Street. See NEW YORK.

Wall Trees. See GARDENING, ESPALIER, FRUIT.

Walmer, a watering-place of Kent, 2 miles S. of Deal; pop of urban district (1921) 5354. Walmer Castle is the official residence of the Lord Warden of the Cinque Ports (q.v.), and is a round-towered castle, built by Henry VIII. It was the favourite residence and the death-place of the Duke of Wellington; and its relics of him, of Pitt, and of other Lord Wardens were in 1892 secured to the nation by the son of the late Right Hon. W. H. Smith. See Rev. C. Elvin's *Records of Walmer* (1891).

Walnut (*Juglans*), a genus comprising seven or eight species of beautiful trees of the family Juglandaceæ. All are trees with alternate pinnate leaves, monœcious flowers, and a drupe-like fruit, with a deciduous fleshy husk, which bursts irregularly, and a deeply wrinkled shell (*putamen*) of two valves, within which is the seed, curiously lobed and wrinkled, with a membranaceous *testa* and partial dissepiments. The Common Walnut (*J. regia*) is a native of Persia and the Himalayas, but has long been cultivated in all parts of the south of Europe. The date of its introduction is unknown, but it was certainly cultivated by the Romans in the reign of Tiberius. It is a lofty tree of 60 to 90 feet, with large spreading branches. The leaves have two to four pairs of leaflets, and a terminal one. They smell of apples when bruised; this quality, however, being much more marked in some trees than in others. The ripe fruit is one of the best of nuts, and is an important article of export from many parts of the south of Europe. Walnuts are also exported in large quantities from Kashmir and other Himalayan regions to supply the markets of India. In the south of Europe walnuts are a very considerable article of food, and when perfectly fresh they are wholesome and nutritious, although in the state in which they are imported into Britain they are not easily digestible. Just before they are ripe they are much used in France with vinegar, salt, pepper, and shallots. Among the varieties of walnut in cultivation is one with a very thin shell, which is much esteemed. Walnuts yield by expression a bland fixed oil, which, under the names of *Walnut Oil* and *Nut Oil*, is much used by painters as a drying oil, and in the countries in which it is produced is a common article of food. The cake left after the expression of the oil is sometimes used as an article of food, and is also used for feeding cattle and poultry. The Timber (q.v.) of the walnut is of great value. It is light, although hard and fine-grained. The wood of young trees is white, and little esteemed; that of old trees is brown, veined and shaded with darker brown and black. The wood of the roots is beautifully veined. Both the root and the husks of the walnut yield a dye, which is used for staining light-coloured woods brown. The walnut, when meant to become a timber-tree, is best sown where it is to remain, as the roots are much injured by transplanting. The best kinds of walnut for fruit are generally grafted. The walnut succeeds well in Britain as an ornamental tree, even in the north of Scotland, although it seldom quite ripens its fruit except in the warmest parts of England. The names in Teutonic lands (O.E. *wealh-hnutu*, Ger. *Wallnuss, welsche Nuss*) indicate that it came into north Europe from Italy and France. Very similar to the common walnut is the Black Walnut (*J. nigra*) of North America, found in most parts of the United States, except the most northern. It is a very large and beautiful tree, the trunk sometimes 6 or 7 feet in diameter; its leaves have more numerous leaflets than those of the common walnut. The timber is even more valuable than that of the common walnut; the fruit is very inferior. The Butternut (*J. cinerea*) is abundant in the northern and north-western states, and in Canada. It is a tree only about 50 feet high, with trunk about a foot in diameter; leaves with fifteen to seventeen leaflets; the fruit elongated, and externally covered with a viscid substance. The nut is hard and rough, with prominent ridges, and of good quality. The wood is not apt to split or warp, and is useful for many purposes. Sugar is obtained from the sap, as from that of the maple, but is of inferior quality. East Asiatic species are *J. mandshurica* and *J. Sieboldiana*.

Walnut (*Juglans regia*).
a, nut; *b*, seed.

Walpole, HORACE, fourth Earl of Orford, author and virtuoso, was born 24th September 1717 (o.s.) in Arlington Street, London. He was the youngest son of Sir Robert Walpole, afterwards first Lord Orford, by his wife Catharine Shorter. In April 1727 he went to Eton, where he had for schoolfellows the future poets Thomas Gray and Richard West. In 1735 he passed to King's College, Cambridge, Gray being already established there as a fellow-commoner of Peterhouse. In 1737 his mother died, and while he was still at the university he was appointed by his provident father to one or two patent places. Quitting college in 1739, he shortly afterwards, with Gray for companion, started on the orthodox grand tour. They visited France and Italy, making a prolonged stay at Florence. At Reggio a growing incompatibility of tastes ripened into a quarrel (of which Walpole in later years accepted the blame), and the companions separated. Then Walpole fell seriously ill at Reggio, and had it not been for the prompt intervention of Joseph Spence, professor of Poetry at Oxford, might have died. He however recovered, and returned to England to take his seat for Callington in Cornwall, to which, in his absence, he had been elected. At this time (1741) his father was tottering to his fall. But there is no reason for supposing that, had Sir Robert continued in power, his son would ever have become an ardent politician. As it was, he spoke but rarely, and only respectably; and although he seems occasionally to have interested himself genuinely in cases like the Byng trial of 1757, his function in politics is that of the chronicling spectator rather than the earnest actor. With the record that he exchanged his Cornish seat in 1754 for the family borough of Castle Rising, which he vacated in 1757 for the other family borough of King's Lynn, the account of his public life may be closed. In 1745 his father died, leaving him a house in Arlington Street (No. 5), with sufficient, if not excessive means. He continued to live the life he had already commenced as a collector and connoisseur, dabbling lightly in familiar verse and *jeux d'esprit*, trifling with history and art criticism, and corresponding voluminously with his friends, especially with Horace (afterwards Sir Horace) Mann, the British

minister plenipotentiary at Florence, whose acquaintance he had made when on the grand tour. In 1747, after temporary trial of a summer residence at Windsor, he purchased, near Twickenham, the cottage which he gradually, by alterations and additions, elaborated into the well-known 'Gothic Castle' and 'curiosity shop' of Strawberry Hill. The transformation thus slowly effected, alternating with authorship, visits to Paris, the establishment of a private press at Twickenham, and the maintenance of an ever-growing correspondence, constituted the chief remaining occupations of his life, which was prolonged until March 1797, when he died in the house in Berkeley Square (the present No. 11) to which he had moved in 1779 from Arlington Street. In 1791, by the death of his eldest brother's son, he had become fourth Earl of Orford, but he was never married. He was buried at the family seat of Houghton in Norfolk.

Walpole's literary efforts are more various than distinguished. His essays in Moore's *World* exhibit a light hand, and he had gifts as a verse-writer. In such squibs as the *Letter from Xo Ho to his friend Lien Chi at Pekin* (1757), in which he anticipates Goldsmith's *Citizen of the World* by three years, he is at his best. In the romance of the *Castle of Otranto* (1764), which may be said to be the offspring of Gothic Strawberry, he not only had a happy idea, but was fortunate enough to inaugurate a new era of supernatural romance. His tragedy of *The Mysterious Mother* (1768), though in capable verse and extremely powerful, is too horrible in its subject for any but the strongest stomachs, and it is a curious contradiction of literature that a work so sombre and impassioned should have proceeded from the pen of so fastidious a personage as its author. Of his remaining books the *Anecdotes of Painting in England* (1761–71) [1780] and *Catalogue of Engravers* (1763), in which he systematised and made intelligible the voluminous data collected by George Vertue the engraver, are perhaps the most valuable, as they contain much which would not otherwise have been preserved. His memoirs of parts of the reigns of George II. and III., published posthumously in 1822 and 1845 respectively, although warped by personal and political prejudice, contain many facts and particulars which the writer's special opportunities of obtaining information render unusually interesting. He also compiled a *Catalogue of Royal and Noble Authors* (1758), *Fugitive Pieces in Verse and Prose* (1758), *Historic Doubts on Richard III.* (1768), an *Essay on Modern Gardening* (1785), &c. Some of the above were printed at his private press at Twickenham, from which, among other and very miscellaneous issues, he put forth editions of Grammont's *Memoirs* (1772); of the *Life of Lord Herbert of Cherbury* (1764); of Lucan's *Pharsalia*, with Bentley's notes (1760); and (for the Dodsleys) of the *Pindaric Odes* of Gray (1757), to whom at this date he had become reconciled. The books printed at the Strawberry Hill Press are the favourite toys of the collector.

Walpole's literary reputation, however, now rests chiefly upon his letters, of which those to Mann, continued assiduously for forty years—a correspondence not to be paralleled in the annals of the post-office—form the staple. His letters in the Cunningham edition extend to 2665; and it is known that there are others still unprinted. Yet, notwithstanding their voluminous character, their interest never flags. Croker, Walpole's persistent critic, reiterating Byron's opinion that they are incomparable, goes on to say that they are 'a perfect encyclopædia of information from the very best sources—politics from the fountain-head of parties, debates by the best of reporters, foreign affairs from an *habitué* of diplomatic society, sketches of public characters by their intimate acquaintance or associate, the gossip of fashionable life from a man of fashion, literature from a man of letters, the arts from a man of taste, the news of the town from a member of every club in St James's Street; and all this retailed, day by day, and hour by hour, to a variety of correspondents—*reddendo singula singulis*—according to their various stations, characters, and tastes, by a pen whose vivacity and graphic power is equalled by nothing but the wonderful industry and perseverance with which it was plied through so long a series of years.' To this may be added the verdict of another writer by no means favourable to Walpole personally: 'We expect,' says Lord Macaulay, 'to see fresh Humes and fresh Burkes before we again fall in with that peculiar combination of moral and intellectual qualities to which the writings of Walpole owe their extraordinary popularity.'

Walpole's life was that of a man of the world with a leaning to letters; and it has no great occurrences. In politics he was an aristocrat by instinct, and a republican by caprice. The former feeling was probably more genuine than the latter, but he was a wit and virtuoso above all. His truest sympathies were with his own class and circle; outside this they were imperfect. To those he liked he was a firm friend; but with many men of his age he reserved his closest confidence for the other sex (Madame du Deffand, Lady Ossory, the Misses Berry). Lord Macaulay made it the fashion to despise him as frivolous and selfish; but he has left us such a legacy of unfailing amusement that at this date the defects of his character need not greatly occupy us.

Walpole's principal works have been published in various editions; complete editions of his *Letters* appeared in 1857–59 (9 vols., ed. Cunningham; new ed. 1890), in 1903–5 (16 vols., ed. Mrs Toynbee; 3 supplementary vols., ed. Paget Toynbee, 1919–25); and selections were made by Seeley (1884), Yonge (1890), and W. S. Lewis (1927). See *Memoirs*, edited by Warburton (1851); and various works of Walpole edited by Paget Toynbee (*Journal of the Printing Office at Strawberry Hill*, 1923; *Reminiscences*, 1924; *Strawberry Hill Accounts*, 1926, &c.); also the study by Austin Dobson (1890), writer of the above article; Havens, *Walpole and the Strawberry Hill Press* (1901); Greenwood, *Walpole's World* (1913); Paul Yvon, *La Vie d'un dilettante* (1924); Dorothy M. Stuart, *Horace Walpole* (1927).

Walpole, Hugh Seymour, English novelist, was born in 1884 in New Zealand (son of G. H. S. Walpole, afterwards Bishop of Edinburgh), spent his childhood in Cornwall, was educated at King's School, Canterbury, and Emmanuel College, Cambridge, and during the Great War served with the Russian Red Cross. The scenes of *The Dark Forest* (1916), *The Green Mirror* (1918), and *The Secret City* (1919) are laid in Russia. Other novels are *Mr Perrin and Mr Traill* (1911), *The Cathedral* (1922), *The Old Ladies* (1924), distinguished by a ruthless but sympathetic delineation of character.

Walpole, Sir Robert, afterwards Lord Orford, statesman, was the third son of Robert Walpole, M.P., and was born 26th August 1676 at Houghton in Norfolk, the seat of his ancestors since Stephen's reign. He received his education at Eton and at King's College, Cambridge. Through the death of his brothers he succeeded to the family estates on the death of his father, and in 1701 was returned to parliament for Castle Rising. In 1702 he was elected member of parliament for King's Lynn, which he continued to represent; and in 1705 he was nominated one of the council to Prince George of Denmark. In this latter capacity he appears to have won the esteem of Godolphin,

Marlborough, and other Whig leaders. In 1708 he was appointed Secretary at War, and in 1710 Treasurer of the Navy. Shortly after this, however, his fortunes suffered a temporary eclipse; he was found guilty by the House of Commons of 'breach of trust and notorious corruption,' and on 17th January 1712 was expelled the House, and sent to the Tower; but it is certain the charge was due solely to party animosity. He had all along been a strong Hanoverian, and on the accession of George I. he was restored to fortune; he was made a privy-councillor, and had various other high offices conferred upon him. On the impeachment of Bolingbroke and others by his means, he became in 1715 Chancellor of the Exchequer and First Lord of the Treasury. A disunion in the cabinet having arisen in 1717, he resigned office, bringing in a Sinking-fund Bill on the day of his resignation. Out of office he has been charged with somewhat unscrupulous opposition. The Peerage Bill of the government (headed by Sunderland and Stanhope) having been defeated mainly by Walpole's resistance, Sunderland gave Walpole (1720) the post of Paymaster-general, and after the collapse of the South Sea Scheme the public looked to Walpole to restore order in public affairs; in 1721 he became First Lord of the Treasury and Chancellor of the Exchequer, and from this time to his final retirement in 1742 the life of Walpole may be said to be the history of England. His chief contribution to the development of the constitution was that, whereas heretofore ministers were regarded as equals amongst themselves, in his person and henceforward there was a prime-minister who gave to cabinet government the necessary unity. By systematic bribery (less in money amount than has been supposed) he secured a Whig House of Commons, and in the House of Commons secured majorities by the bribes both of money and of office. He it was who trained the Whig lords to rely not on their peers but on the Commons. His first successful trial of strength (1724) was with Carteret; later he held his own against the attacks of Bolingbroke and Pulteney; forced on the breach with his brother-in-law Townshend, who retired (1730) into private life; and quarrelled with Chesterfield (q.v.). He crushed Atterbury's plot; withdrew the grant for 'Wood's Halfpence' on the storm raised by Swift's *Drapier's Letters* (1723); failed to pass a famous Excise Bill (1733); and lost credit by his peaceful foreign policy, which Pitt and Newcastle attacked, the Prince of Wales also joining the opposition for other reasons. In 1740 a motion was made in the House to petition the king to remove Sir Robert Walpole 'from his Majesty's presence and counsels for ever.' This motion was negatived by a large majority; but the power of the great minister was seriously shaken. He resigned on 2d February 1742, when he was created Earl of Orford, with a pension of £4000 a year. His son had been created Baron Walpole in 1723. Charges of bribery were now brought against him, and a committee of investigation was ultimately appointed by the House of Commons; it consisted of twenty-one members, of whom only two were of his own party. The Report was against him, but it was unsupported by evidence, and proceedings were ultimately dropped. The rest of Walpole's life was spent in tranquillity and retirement. He died 18th March 1745. In private life he was amiable and good-tempered, but was essentially coarse-minded, as well as jealous; love of power appears to have been his ruling motive of action. He had strong common sense, with clearness of political vision, and seems to have understood the true interests of his country beyond any of his contemporaries; it was he who secured the permanence of the Revolution Settlement, and in his time peace was much needed by the country.

See the articles GEORGE I., GEORGE II., ATTERBURY, CARTERET, TOWNSHEND, SOUTH SEA SCHEME, SINKING FUND; Coxe's *Memoirs of Sir Robert Walpole* (3 vols. 1798); monographs on him by Ewald (1877) and Lord Morley (1889); Brisco, *Economic Policy of Walpole* (1907); J. M. Robertson, *Bolingbroke and Walpole* (1919); the Histories of Ralph, Stanhope, McCarthy, and Lecky; works cited at HORACE WALPOLE; and Jessopp's *One Generation of a Norfolk House* (1878).

Walpole, SIR SPENCER (1839–1907), son of Spencer Horatio Walpole (1806–98), Home Secretary under Lord Derby (in 1852, 1858–9, and 1866), was educated at Eton, had a post in the War Office, was made inspector of fisheries in 1867, in 1882 lieutenant-governor of the Isle of Man, and in 1893–99 was secretary to the Post Office, being a K.C.B. from 1898. He wrote, besides *Essays Political and Biographical* (1908), lives of the Right Hon. Spencer Perceval (his grandfather, 1873) and Lord John Russell (1889); two volumes in the 'English Citizen' series; and the *History of England* (from 1815; 5 vols. 1878–86), continued in the *History of Twenty-five Years* (to 1880; 4 vols. 1904–8).

Walpurga, ST, sister of St Wilibald, came with him from England to Germany, was abbess of Heidenheim, and died about 778. Her day is the 1st of May. Hence she has been accidentally associated with some strange popular superstitions connected with the 1st of May. During 'Walpurgis Night,' between 30th April and 1st May, the witches rode on broom-sticks and he-goats to the ancient places of sacrifice, to hold revel there with their master the devil. The best known of these witch-hills was the highest point of the Harz, the Brocken (q.v.), famous as the scene of the witches' Sabbath in Goethe's *Faust*.

Walrus, or MORSE (*Trichechus*), a genus of aquatic, web-footed (pinniped) Carnivores, sole living representative of a family (Trichechidæ) in many ways intermediate between the sea-lions and the seals. The skull of a large extinct form, Alachtherium, is also referred to the same family. The walrus resembles the seal in the absence of external ears, and the sea-lion in the way in which the hind feet are turned forward and used in hobbling along, but is at once distinguishable by the development of the upper canines into enormous tusks, which may be 30 inches long. There is but one species, *T. rosmarus* of the Arctic seas.

A full-grown animal measures from 10 to 11 feet in length, and there is force in the old description which pictured the huge creature as 'large as an ox and thick as a hogshead.' The head is relatively small; the eyes, fierce to look at, are small; external ears are absent; the muzzle, with swollen upper lips, bears stiff whiskers, each hair as thick as a crow quill; the shoulder region is strong and massive; the short tail is hidden by a flap of skin which unites the hind legs; the limbs are webbed flippers with minute nails on all the digits except the three middle toes of the hind foot, where they are large

Head of Walrus.

and strong; the soles are bare and roughly furrowed; the hair is short, and varies in colour from light yellow above to chestnut brown below; the thick loose skin tends to become bare as the animal grows older, and is often much wrinkled and scarred. The dentition of the young is expressed in the formula $\frac{3}{3}$, $\frac{1}{1}$, $\frac{5}{4}$, but many of the teeth are lost or remain rudimentary, and the adult has only $\frac{1}{0}$, $\frac{1}{1}$, $\frac{3}{3}$. The tusks do not become conspicuous until the animal is about two years of age.

Walruses live near the coasts among the Arctic ice, often on floating packs. They are gregarious in habit, posting sentinels, and aiding one another with all their strength against the attacks of men or polar bears—practically their only enemies. Apart from the fierce contests between rival males at pairing time, they are peaceful animals, but when molested or robbed of their young display much ferocity. In their sexual relations they are said to be monogamous; the young are born, after a gestation of about a twelvemonth, between the months of April and June, and normally there is but one at each birth. As the pathetic tales of the walrus-hunters amply testify, the females tend their offspring with solicitude, and will fight for them to the death, while the young during the prolonged period of suckling—lasting for one or two years—are tenaciously affectionate to their mothers. Walruses feed chiefly on bivalves, especially *Mya truncata* and *Saxicava rugosa*, which they dig up with their tusks, crush with their tongue and back teeth, and so sift that only the soft parts are swallowed. Besides bivalves, they also eat crustaceans, star-fishes, sea-urchins, worms, and the like, and have a strange habit of swallowing pebbles. The tusks are chiefly used in grubbing for food, but they are also formidable weapons, and according to the majority of observers they also serve to break breathing holes in the ice, and to help the animals, which are as awkward out of water as they are agile in it, to climb among the rocks and ice. In the autumn the walruses have a period of fasting, the precise nature of which is not clearly known. The voice of the walrus is a roaring bark, 'between the mooing of a cow and the deep baying of a mastiff.'

Mainly as the result of ruthless destruction, the range of the walrus has been greatly narrowed, for they are no longer found so far south as they once were, and in many parts of the Arctic regions where they were once abundant they are now scarce. This is not to be wondered at, as there are records of hunts during which as many as a thousand walruses were captured. Sometimes they are surprised on land, and then they fall easy victims to the hunter; usually, however, they are attacked in the water by harpooning-boats, and this is often full of hazard. The oil of the walrus is used like that of seals; the hide is made into harness, ropes, and fishing-lines; the ivory tusks form weapons, utensils, and ornaments, and the flesh is eaten by the Eskimos and Tchuktchis. The word walrus is Norwegian (*hval-ros*, whale-horse), and another Norwegian name, *rosmar*, has been translated into one of the common English titles, sea-horse. The name *morse* is from Lapp or Finnish. The Eskimos and Greenlanders call the creature Awŭk from its cry. See Lamont, *Seasons with the Sea Horses* (1861).

Walsall, a municipal, parliamentary, and county borough of Staffordshire, is situated on an eminence above a small feeder of the Tame, 8 miles NNW. of Birmingham, 6 E. of Wolverhampton, and 123 NW. of London. An ancient place, but of modern development, it stands on the edge of the South Staffordshire coalfield, and manufactures saddlers' ironmongery and all kinds of saddlery, carriages, iron and brass, leather, &c., whilst in the vicinity are coal-pits, limestone-quarries, and brickyards. The public buildings include an Italian Renaissance guildhall (1867), county court-house (1869), post-office (1879), public library (1859), grammar-school (1554; rebuilt 1850), and cottage hospital (1878); and in 1886 a statue was erected of 'Sister Dora' (Miss Pattison, q.v.). Walsall was the scene in 1891–92 of an Anarchist conspiracy, for which four dynamiters were convicted. It became a municipal borough in Henry IV.'s reign; a parliamentary borough, returning one member, in 1832; and a county borough in 1888. Pop. (1851) 25,680; (1891) 71,791; (1921) 96,964.

Walsh, William (1663–1708), English writer and critic, M.P. for Worcester and Richmond (Yorkshire), wrote a *Dialogue concerning Women* (1691), *Æsculapius* (1714), and a number of 'elegies' and love-poems, and aided Vanbrugh and Congreve in the adaptation of *Monsieur de Pourceaugnac* (1704). He made the acquaintance of Pope, and, amongst other counsels, advised him to be a 'correct' poet, that being now 'the one way left of excelling.' Walsh is included in Johnson's *Lives of the Poets*, also in vol. iii. of the collection by the so-called Theophilus Cibber.

Walsham, North, a market-town of Norfolk, 14 miles N. by E. of Norwich. It has a large Perpendicular church with a ruined tower, and a market-cross (rebuilt 1600). Pop. (1921) 4156.

Walsingham, a small town in the north of Norfolk, 31 miles NE. of King's Lynn by rail. The Augustinian Priory, of which some ruins are left, was founded according to tradition in 1016. It contained a famous image of the Virgin, known as 'Our Lady of Walsingham,' to which many pilgrimages from all over Europe were made. Henry VIII. made the pilgrimage barefoot, and Erasmus's *Peregrinatio religionis ergo* records a visit of the great humanist. At Old Walsingham, a small village 1 mile NE., Roman remains have been found.

Walsingham, Sir Francis, born at Chiselhurst, Kent, about 1536, studied at King's College, Cambridge, and afterwards travelled on the Continent, where he remained until the accession of Queen Elizabeth. Burghley, with his usual discernment, discovered his abilities, brought him into office, and sent him on an embassy to France in August 1570. He remained in Paris until May 1573, and discharged diplomatic duties with such consummate skill that he was, on the recommendation of his great patron, appointed one of the principal secretaries of state to Elizabeth. He was also sworn of the Privy-council, and knighted. In 1578 he was sent on an important embassy to the Netherlands, in 1581 to France, and in 1583 to Scotland. He was, with some reason, regarded by the adherents of Mary, Queen of Scots, as the most insidious of her enemies in the English council. He contrived to intercept most of her letters, and after deciphering them sent them to their destination, in order to obtain fresh intelligence from their answers. He soon held her safe in the toils. Up to Babington's (or, as some have called it, Walsingham's) conspiracy there was no evidence for charging her with being accessory to any of the plots formed against the life of Elizabeth. The real fountain-head of this conspiracy, and the chief confederates, were spies in the pay of Walsingham, and all the correspondence of Mary and her friends passed through the hands of Elizabeth's dexterous minister. After the discovery and execution of Babington and his confederates Walsingham went to Fotheringhay as one of the commission to try Queen Mary. She charged him with having forged the correspondence produced against

her, when Walsingham rose in his place and solemnly called God to witness that he had not done anything unbecoming an honest man, and that he was wholly free from malice. Elizabeth signed her death-warrant with a jest on Walsingham's hatred of the Queen of Scots. She had ordered Davison to bring her the warrant, and when she had signed it she said: 'Go, tell all this to Walsingham, who is now sick; though I fear he will die for sorrow when he hears it.' Walsingham was distinguished even among the ministers of Elizabeth for acuteness of penetration, extensive knowledge of public affairs, and profound acquaintance with human nature. His administration of foreign affairs was founded on the system of bribery, espionage, and deception. He is said to have had in his pay fifty-three agents and eighteen spies in various countries; and no minister was better informed of the intrigues of foreign courts. Notwithstanding this diplomatic duplicity, which was then universal among public men, Walsingham's personal integrity and disinterested patriotism are undoubted. He was of strict morals, favoured the Puritan party, and in his later days gave himself up to religious meditation. He retired from public affairs some time before his death, and resided at his house in Barn Elms. He died in Seething Lane, London, 6th April 1590. Elizabeth was ready enough to acknowledge his diligence, genius, and important services, but there remain in the British Museum (Harleian MSS.) various letters from Walsingham complaining of his being wholly unable, on his scanty appointments, to support his establishment, though very inadequate to his dignity of ambassador in France. Elizabeth may not, perhaps, have recompensed him adequately, but Walsingham managed to make his expenditure exceed his income. Camden says he died so far in debt that he was buried privately by night in St Paul's Church, without any funeral solemnity. The queen was chary, certainly, in conferring honours upon him, for he received nothing but his knighthood, and held no offices when he resigned the charge of foreign affairs. His daughter Frances became successively the wife of Sir Philip Sidney, of the brilliant and unfortunate Earl of Essex, and of the brave soldier, Richard de Burgh, fourth Earl of Clanricarde. See Stählin, *Walsingham und seine Zeit* (1908); Conyers Read, *Mr Secretary Walsingham* (1925).

Walsingham, THOMAS, precentor of the abbey of St Albans under Richard II., and afterwards prior of the cell of Wymundham, one of the most eminent of the famous historians of St Albans, died about 1422. His *Historia Anglicana* forms vols. i. and ii. of the *Chronica Monast. S. Albani* (Rolls series, 1863–64). For the first fifteen years of Richard II. (1377–92) it is an authority of the highest value; the earlier period (1272–1377) is grounded chiefly on the *Annals* of St Albans; the concluding portion, from 1393 to 1422, contains many inaccuracies, so much so that its editor in the Rolls series thought it the work of another hand. But Gairdner held that the writer of both was one and the same.

Walter, HUBERT. See RICHARD I.

Walter, JOHN. See TIMES, PRINTING.

Walter, LUCY. See CHARLES II.

Waltham, a market-town of Essex, on the Lea, 13 miles N. by E. of London. Called also Waltham Abbey and (officially) Waltham Holy Cross, it retains the nave of a stately Norman church, which, rebuilt by Harold in 1060 for a collegiate chapter, served from 1177 for an Augustinian abbey. A miraculous cross had been brought here from Montacute in Somerset; and here probably Harold was buried. Both the nave and a Decorated lady chapel have been restored; they serve for the parish church, of which Bishop Hall and Thomas Fuller were incumbents. Waltham has memories also of Cranmer and Henry VIII. Waltham Cross, which takes its name from a different cross (see CROSS, p. 582), is 1¼ mile W. in Hertfordshire, and forms part of Cheshunt urban district; 1 mile farther W. again is Theobalds (q.v.). The Lea's many channels form a network of islands, on which are vast gunpowder-mills belonging to government. Enfield (q.v.), in Middlesex, is near. Waltham has large manufactures of sporting cartridges, and in the district market-gardening is widely carried on. Pop. of Waltham Holy Cross urban district (1921) 6847. See works by Fuller (1655; ed. by Nichols, 1837) and Bishop Stubbs (1860).

Waltham, a city of Massachusetts, on the Charles River, 10 miles by rail WNW. of Boston, with very important old-established manufactories of cottons and watches; pop. 34,900.

Walthamstow, an industrial suburb of London, in Essex, 6 miles NE. of St Paul's, since 1918 a two-member parliamentary borough; pop. (1851) 4959; (1891) 46,346; (1921) 127,441.

Walther von der Vogelweide, best of the Minnesinger and greatest German poet of the middle ages, was born about 1160, probably in Tirol; but the place of his birth is unknown, nor has it been proved where the Vogelweide was from which he took his name. In 1180–98 he was at Vienna, at the court of the Dukes of Austria, and in high favour there; later we find him at Mainz and Magdeburg; in 1204 he outshone his rivals in the great poetical contest at the Wartburg (see MINNESINGER). He sided with the Guelph emperor Otto IV. till his cause was utterly lost, but afterwards made friends with the victorious Hohenstaufen, Frederick II., who gave the poet a small estate. Here he died about 1230, and was buried in the cathedral of Würzburg. Love was his main theme, as that of the other Minnesinger, and he sang both sweetly and with warm human feelings in varied and artistic forms of verse. But he could also stir the hearts of his contemporaries by his patriotic pride in the Fatherland, by his praise of justice, and his support of national duty. He was even regarded by some as having exercised by his verse a too great influence on public feeling in political matters. He was also famous as an inditer of weighty proverbs and maxims.

There are editions of his works by Lachmann (1827), Haupt (1853), Pfeiffer (1864), Bartsch (1873), &c.; translations into modern German by Obermann (1886), &c., and into English by Alison Phillips (1896); Lives and critical studies by Uhland (1822), Menzel (1865), Wilmanns (1882), Schönbach (1895; new ed. 1910); and a full Bibliography by Leo (1880).

Waltner, CHARLES, etcher, born at Paris in 1846, became famous by his etchings after Rembrandt, Rubens, Van Dyck, and Velázquez; amongst his best-known etchings are those of Millet's 'Angelus,' and Munkacsy's 'Christ before Pilate.' He became a member of the Académie des Beaux Arts in 1908.

Walton, BRIAN, editor of the great London Polyglott Bible, was born at Seymour in Yorkshire in 1600, was educated at Magdalene College and Peterhouse, Cambridge, and became in 1626 rector of St Martin's Orgar in London, to which was added the rectory of Sandon in Essex in 1636. In 1641 he was sequestered, and he thereupon found refuge in Oxford, afterwards in his second father-in-law's house in London, where he devoted himself to his great work, which came out by a subcription of ten pounds a set in six folio volumes (1654–57). He had been aided by Usher, Light-

foot, Pocock, and many other scholars, and Cromwell himself favoured the scheme, as acknowledged in the original preface. Walton was consecrated Bishop of Chester in December 1660, and died in London, 29th November 1661. Some portions of Walton's Polyglott are printed in seven languages, all open at one view. No one book is given in nine languages, but nine are used in the course of the work, Hebrew, Chaldee, Samaritan, Syriac, Arabic, Persian, Ethiopic, Greek, and Latin. Dr Edmund Castell's *Lexicon Heptaglotton* (2 vols. folio, 1669), giving lexicons and grammars of the languages contained, is its necessary complement. Other works were his *Introductio ad Lect. Orient.* (1654) and *Considerator Considered* (1660), an answer to Owen, who found things prejudicial to the faith in the *Prolegomena* to the Polyglott and in the large number of various readings admitted.

See the Life by H. J. Todd (2 vols. 1821), the second volume containing a reprint of the answer to Owen.

Walton, Izaak, the 'Father of Angling,' was born at Stafford, 9th August 1593. Of his early years we know nothing save that his father died early; but in 1624 we find him settled in Fleet Street, near Chancery Lane, London, carrying on business probably as an ironmonger, but according to some as a linen-draper. Later he removed into Chancery Lane itself. In the end of 1626 he married Rachel Floud, a great-grand-niece of Cranmer, and it is not improbable that from her uncle George Cranmer, who had been a pupil and friend of Hooker, he may have derived the materials for his life of the great divine. His wife died in August 1640 after giving birth to a daughter—the two sons she had borne him were already dead. About 1644 he retired to a small estate near Stafford with such a modest competence as sufficed for his simple wants, and in 1647 he married Ann Ken, half-sister of the future bishop, then a boy ten years old. She bore him a daughter, Anne, who married Dr Hawkins, a prebendary of Winchester, and died in 1715, and two sons, of whom the younger survived him, became a canon of Salisbury, contributed largely to Walker's *Sufferings*, and died in 1719. Walton lost his second wife in 1662, and buried her in Worcester Cathedral. Wood tells us he spent most of his time 'in the families of the eminent clergymen of England, of whom he was much beloved.' He had been a close friend of Dr Donne, vicar of St Dunstan's, the parish he lived in, and was urged by Sir Henry Wotton to collect materials for the life of the poet-dean. Donne's sermons being about to be reprinted without a life, Walton himself took up the task, left untouched by Sir Henry at his death in 1639, and so produced under the spur of necessity one of the most delightful biographies in miniature within English literature. Already in 1631 he had mourned Donne's death in an *Elegy*, in which he calls himself his convert. Others among his intimate friends were Morley and Sanderson, after the Restoration bishops of Worcester (then Winchester) and Lincoln, while yet another friend, Dr King, was reinstated in the see of Chichester. In his later years he lived much at Winchester, closed his blameless life there in the house of his son-in-law, 15th December 1683, and was buried in Prior Silkstede's chapel in the south transept of the cathedral.

The first edition of *The Compleat Angler, or the Contemplative Man's Recreation*, appeared in 1653; the fifth, grown from thirteen chapters to twenty-one, in 1676. The latter contained also Charles Cotton's 'Second Part of the Complete Angler, being Instructions how to Angle for Trout or Grayling in a Clear Stream.' To the two original interlocutors, 'Piscator' and 'Viator,' Walton had already added in the second rewritten and greatly enlarged edition (1655) the falconer ('Auceps'), and changed 'Viator' into 'Venator.' A fishing expedition to the Hertfordshire streams between Ware and Waltham furnishes a slight narrative framework for the book, and after each of the three, the bird-catcher, the hunter, and the fisher, has commended in turn his own recreation, Piscator adopts Viator as his pupil in the art of angling, and discourses to him on the otter and chub, the trout, the artificial minnow and flies, the umber or grayling, the salmon, the luce or pike, the carp, the bream, the tench, the perch, the eel, the barbel, the gudgeon, ruffe, and bleak, the roach, dace, and caddis, the minnow or penk, loach, and bull-head or miller's thumb, of the various English rivers, of fish-ponds, and of rods and lines. The discourse is interspersed with scraps of dialogue, moral reflections, quaint old verses, songs, and sayings, and idyllic glimpses of country-life, and the whole breathes such cheerful piety and contentment, such sweet freshness and simplicity as to give the book a perennial charm altogether its own. Walton loved God and man with an unaffected simplicity of mind which cast a radiant atmosphere of happiness around all the idyllic pictures that he saw, for the charm of the book is not so much in the matter, or even the manner, as the unconscious picture of the writer's own disposition. The book was the delight of Charles Lamb's childhood. Writing to Coleridge, he says 'it breathes the very spirit of innocence, purity, and simplicity of heart. . . . It would sweeten a man's temper at any time to read it; it would Christianise every discordant angry passion.'

Not less exquisite and indeed unique are his *Lives*—of Donne (1640), Wotton (1651), Hooker (1665), Herbert (1670, when the four were collected), and Sanderson (1678)—'Satellites burning in a lucid ring Around meek Walton's heavenly memory.' This was one of Dr Johnson's favourite books, and Boswell tells us he counted the Life of Donne as the most perfect of the five.

Numerous editions of the *Compleat Angler* with introductory monographs have appeared, including those of Sir John Hawkins (1760); Major (1824, 1835, 1844); Sir Harris Nicolas, with a good Life of Walton (1836); Dr G. W. Bethune (New York, 1847); Ed. Jesse and H. G. Bohn (1856); Dowling (1857); R. le Gallienne (1897); A. Lang (1897); Austin Dobson (1899); Marston (1915). Of the *Lives* there are editions by Dr Thomas Zouch, with a poor Life (York, 1796), Major (1825), Bullen, with W. Dowling's Life (1884), Sampson (1903). See also Martin, *Walton and his Friends* (1903).

Walton-le-Dale, an urban district of Lancashire, 1½ mile SE. of Preston, but on the south bank of the Ribble. Walton-le-Dale, which was probably the site of a Roman station, has an ancient church, and was the scene of a battle (1648) between Cromwell and the Scots. Cotton-spinning is the chief industry. Pop. 12,000.

Walton-on-Thames, a Surrey urban district, 17 miles (by water 28) SW. of London. Its church has some interesting monuments, and Lilly is buried here. Pop. (1921) 14,647.

Waltz (Ger. *Walzer*, Fr. *valse*), a German dance, which first became fashionable in other countries in the early part of the 19th century, being introduced into England about 1813, and condemned as immodest by Byron and others. The *Valse à Deux Temps* is a form of the waltz not so graceful as the older one, because not so correspondent to the rhythm of the music. Johann Strauss, Gungl, and Waldteufel were well-known waltz-composers; and there are idealised concert-waltzes, not suited for dancing, by Schubert, Weber, Chopin, Liszt, Brahms, Ravel, &c.

Walvis Bay (Dutch, *Walvisch*, 'Whale'), anglicised as Walfish Bay, a territory of 430 sq. m. on the west coast of Africa, 420 miles N.

of the mouth of the Orange River. Declared British in 1878, it was annexed to Cape Colony in 1884, and is now administered as part of the protectorate of South-west Africa. The bay affords a secure anchorage, and the new harbour (1926) makes it the principal port of the territory. It is connected by rail with the interior. Pop. 1180.

Wampum, a name given to shells, about an inch long and twice the thickness of a knitting-needle, used as money by the American Indians.

Wandering Jew. The legend of a Jew who cannot die but must wander till the day of judgment, for an insult offered to Christ on the way to the Crucifixion, is not ancient nor wide-spread. There is no trace of it in the early middle ages either in the East or West, and the popularity of the story is mainly confined to some countries of north-western Europe—Germany, Scandinavia, the Netherlands, and France. Matthew Paris tells us in his *Historia Major* (completed 1259) that an Armenian bishop visited England in 1228, and among other wonders of his country told of one Cartaphilus who had been present at the Passion being then alive and well known to himself. He was a door-keeper in the palace of Pilate, and as Jesus was being led past to his crucifixion he struck him with the words 'Go, Jesus: go on faster.' To which Jesus answered, 'I go, but thou shalt wait till I return.' Cartaphilus was baptised by Ananias with the name of Joseph, and settled in Armenia, where he had often sat at the archbishop's table. Thirty years old when he insulted Christ, whenever he reaches a hundred he falls into a faint, and on recovery finds himself at the age he was when his doom was pronounced. Some years later we are told that the archbishop's brother visited England, and some of his attendant monks confirmed the story. We next find it repeated in the *Chronique* by Philippe Mouskets, written at Tournai about 1243.

Three hundred years later we find the next development of the legend in the story that the Wandering Jew was seen at Hamburg in 1547 by Paul von Eitzen, Bishop of Sleswick, listening to the sermon, tall, ragged, gaunt, bare-footed, his long hair falling over his shoulders. He had been a shoemaker at the death of Jesus, his name was Ahasuerus. He spoke the languages of all countries, was never seen to laugh, and rebuked blasphemies against the name of Christ with awe-struck severity. This story was widely current about the beginning of the 17th century, and a form of it is extant, with full details, vouched for by a letter signed Chrysostomus Dudulæus Westphalus, and dated Refel [Reval], 1st August 1613. From this time forward we meet with many precise versions and variations. One of the most celebrated appearances was that to two grave citizens together at Brussels in 1640. Here the name given to him is Isaac Laquedom, which Böttcher thought likely to be a corruption by some half-learned man from the Hebrew (*la-kĕdem* = the former world). The German *Volksbuch* versions (from 1602) had been early translated into French, Dutch, Danish, Swedish; in English at least they inspired a ballad in Percy's *Reliques*. There is a beautiful French *complainte* on the subject, apparently of Belgian origin, which gives him again the name of Laquedom. Yet another name given him is Buttadeus—the Bedeus of the Transylvanian Saxons, the Italian Buttadio, the Boudedeo of the beautiful Breton *gwerz* translated by M. Luzel.

Further appearances are recorded at Beauvais, Leipzig, Lübeck, Moscow, Madrid, and even Hull—a tract of 1769 'authenticated by four ministers of Hull in Yorkshire,' tells how 'some time since' he visited Hull and was locked up, but the prison doors flew open to him whom the Almighty had denied a resting-place. The *Turkish Spy*, writing from Paris in 1644, gives an account of a conversation with him as Michob Ader in several languages, five or six hours together in Arabic. The 'Younger Brother of Time' said there was scarce a true history to be found, and unhappily he could give no satisfactory account of the whereabouts of the lost Ten Tribes.

The theme touched the imagination of Goethe, but he abandoned it for Faust. Others who have treated it artistically are A. W. Schlegel, Chamisso, Edgar Quinet, Lenau, Hans Andersen, Klingemann, and Ed. Grenier. The introduction of the Wandering Jew in Sue's romance is the crowning absurdity of that absurd book—his death is an outrage to dramatic consistency which makes his whole history ridiculous. George Croly's novel, *Salathiel*, is named only because it is English. See studies by Grässe (1844), F. Helbig (1874), C. Schoebel (1877), Gaston Paris (1880), Moncure D. Conway (1881), Neubaur (1884–1912 and 1913), Soergel (1905), Kappstein (1906), König (1907).

Wanderoo (*Macacus silenus*), a catarrhine monkey, a native of the Malabar coast of India.

Wanderoo (*Macacus silenus*).

It is 3 feet long to the tip of the tail, has a slim body, pink buttocks, dark hair, and a great mane of long whitish hair round the face. Fabulous stories are current of its cunning and mischievousness; but there is no doubt as to its intelligence. The Rhesus Monkey (q.v.) is another Macacus.

Wandiwash, a town of North Arcot, Madras, scene of the victory by Sir Eyre Coote (q.v.).

Wandsbeck, a town of Holstein, Germany, a NE. suburb of Hamburg; brewing and distilling are carried on. Pop. (1925) 39,641.

Wandsworth, an industrial metropolitan borough of the county of London, 5½ miles SW. of St Paul's. The parliamentary borough has five divisions: Balham and Tooting, Central, Clapham, Putney, Streatham. Pop. (1921) 328,656.

Wanganui, a New Zealand port, 4 miles from the mouth of the Wanganui River, 135 miles NW. of Wellington; pop. (1926) 26,130.

Wankies, a great coal-mining centre in Southern Rhodesia, 200 miles NW. of Bulawayo on the railway from Capetown.

Wanks. See HONDURAS.

Wanlockhead, a Dumfriesshire village in the Lowther Hills, 1½ mile from Leadhills, has had lead-mines since 1512. With Leadhills in Lanark-

shire it disputes the title of highest village in Scotland.

Wansbeck. See MORPETH.

Wansdyke, an earthwork, consisting of an earthen mound with a ditch on its north side, runs from near Portishead on the Bristol Channel in a more or less easterly direction to Inkpen Beacon. Its age is unknown. Part at least is later than Roman times. See A. F. Major, *The Mystery of Wansdyke* (1926).

Wantage, in the Vale of the White Horse, Berkshire, 26 miles W. of Reading, has a 14th-century church and old grammar-school. King Alfred and Bishop Butler were natives. Pop. 3600.

Wantley, the home of the dragon worsted and slain in a fight celebrated in a mock heroic ballad (early 17th century) printed in Percy's *Reliques*. The name may have some connection with the Wortley family, whose seat, Warncliff Lodge (locally Wantley), is 6 miles from Rotherham in Yorkshire.

Wantsome. See THANET.

Wapenschaw, in ancient Scottish usage, a periodical gathering of the people within various areas for the purpose of seeing that each man was armed in accordance with his rank, and ready to take the field when required. Numerous statutes regulate the wapenschaws, and under the later Stuarts attendance was rigorously enforced. Sports, archery, &c. were indulged in at such meetings. The name has been in some places revived for volunteer meetings and shooting competitions.

Wapentake, a name given in Yorkshire (q.v.), and formerly elsewhere in England, to the territorial divisions of the county, similar to what in most other English counties are called *hundreds*, and in the more northern counties *wards*.

Wapiti (*Cervus canadensis*), a species of deer, 4½ feet high at the shoulder. It is a native of North America, once ranging as far south as

Wapiti (*Cervus canadensis*).

Carolina, and as far north as 56° or 57° N. lat., but now much restricted. They used to range on the plains and foothills, but they have become mountain animals. Most are to be found in Wyoming, especially in and about the Yellowstone National Park. It is yellowish brown on the upper parts; the sides gray; a pale yellowish patch on each buttock, bounded by a black line on the thigh; the neck a mixture of red and black, with long, coarse black hair falling down from it in front like a dewlap; a black mark at each angle of the mouth. The antlers are much like those of the Red Deer, but the first branch bends down almost over the face. The wapiti is called *elk* and *gray moose* in some parts of America, although very different from the European elk or the American moose. The Chinese wapiti, the hangar of Kashmir, and the maral of Turkestan are all links between the Red Deer and *C. canadensis*.

Wappers, GUSTAVE, BARON (1803–74) Belgian, historical painter, founder of a 'national' school, was born at Antwerp, studied there and at Paris, became professor of painting at Antwerp in 1832 and directed the Academy there 1840–59.

War is a form of political activity, the struggle by force of arms on sea or land between states when diplomacy has failed to affect agreement (international war), or fighting between uncivilised tribes (inter-tribal war), or between different parties in the same state (civil war). The laws of war are treated of in this work in a long series of articles, such as those on International Law, Articles of War, Blockade, Contraband, Enemy (where the declaration of war is dealt with), Martial Law, Neutrality, &c. The means of conducting warfare come under such heads as those of Army, Navy, Fortification, Siege, Strategy, Tactics. Many of the great wars of history have separate articles—Crimean War, Peninsular War, Seven Years' War, Thirty Years' War, Wars of the Roses, World War, &c.—or are discussed in the histories of the countries they affect (Carthage, Rome, France, United States, &c.) and of the commanders who waged them (Alexander, Cæsar, Hannibal, Frederick the Great, Napoleon, Wellington); see, too, the articles on great battles, Waterloo, &c.

It is difficult to estimate even approximately the cost, directly or indirectly, of great wars, apart from the loss of life. Our Crimean war cost us £70,000,000 and 20,000 lives; War of Secession (1861–1865) 600,000 lives and £2,000,000,000; France in 1870–71 lost 290,000 lives and spent £316,000,000. Our South African war cost us £250,000,000. But the World War created in these respects an incredible record. The Allies fighting Germany had 9 millions of men killed or permanently disabled; the Central Powers lost through death or disablement 12 million men. The war cost 28,600,000 casualties in all, with over 15,000,000 deaths. The Allied governments found an expenditure of 29 thousand million pounds, the enemy spending during the war itself from 13 to 14 thousand million. Omitting shipping losses, claims for pensions, damage to property, the total bill of the belligerents has been 42 thousand million; including these items, 52 instead of 42.

THE WAR DEPARTMENT has charge of everything connected with the army. In Great Britain it is a department of the state under a cabinet minister, the Secretary of State for War (abroad, war minister), assisted by a permanent and a parliamentary under-secretary.

THE WAR OFFICE is the immediate office of the Secretary of State for War, who, under the sovereign, is the head of the army, and responsible for everything connected with it. Before the Crimean war the administration of the army was divided amongst the War Office, Horse Guards, Ordnance Office, Treasury, Colonial Office, and Foreign Office. In 1856 it was concentrated in the War Office, which was divided into three great branches representing roughly men, money, and *matériel* under the Officer Commanding in Chief, the Financial Secretary, and the Surveyor-general of the Ordnance respectively. As the result of shortcomings discovered during the South African War (1898–1902) a War Office Committee was appointed in 1903 under Lord Esher, which in 1904 advised the reconstruction of the Committee of Defence and the formation of an

Army Council. The Committee of Defence, as reconstituted, is a purely advisory body with no executive duties; it considers all questions of imperial defence from the point of view of the navy, the army, the air force, India, and the colonies. The 'permanent nucleus' is the secretary, who has several assistants. The Prime Minister is *ex officio* president, and the membership includes the secretary of state for foreign affairs, the secretaries for war, air, the colonies, India, &c. &c. There are several sub-committees to enable closer co-operation between the various interests concerned. The Army Council, created by patent in 1904, is now the administrative head of the army. It consists of the Secretary of State for War as president, and four military and two civil members. The military members are the Chief of the General Staff, the Adjutant-general to the Forces, the Quartermaster-general to the Forces, and Master-general of the Ordnance—each responsible for his several department. The civil members are the parliamentary Under-secretary for War and the Financial Secretary, who is responsible for the finance of the army. A permanent Under-secretary of State is secretary. The office of Commander-in-Chief has been abolished and an Inspector-general of the Forces appointed. His duties are to 'review generally, and report to the Army Council on the practical results of their policy, and to inspect and report upon the training of all troops, and generally on the fitness and readiness of the army for war.' There are also inspectors of cavalry, artillery, engineers, and stores. See ARMY, STAFF.

Warasdin. See VARAŽDIN.

Warbeck, PERKIN, a pretender to the crown of England, acknowledged in his own confession that he was a native of Tournay, son of one John Osbeck. In 1490 he appeared at the court of the Duchess of Burgundy, sister of Edward IV. of England, and here professed to be Richard Duke of York, the younger of the two sons of Edward IV. murdered in the Tower. This prince was born in 1472, and the claimant would no doubt be about the same age. In 1491 he landed at Cork, where he was welcomed. Next year he was received at the court of Charles VIII. of France as Duke of York; and from the court of Burgundy, where he was treated as nephew of the duchess, he made an ineffectual landing in Kent (July 1495). He next went to Ireland, then to Scotland, where James IV. gave him his kinswoman, Catherine Gordon, the daughter of the Earl of Huntly, in marriage. In 1498 he sailed by Ireland to Cornwall in order to profit by the disaffection there, attempted to besiege Exeter, then went on to Taunton, but ran away with un-Plantagenet poltroonery by night to the sanctuary at Beaulieu in Hampshire. He surrendered on promise of pardon, and was subjected to an easy imprisonment. Next year he managed to escape, but was caught at Sheen. He was thrown into the Tower, and it was more than probable an opportunity was purposely afforded him to plot an escape with the imprisoned Earl of Warwick. He was executed in November 1499, as was also the ill-fated Warwick. Thus, says Bacon, did 'this winding ivy of a Plantagenet kill the true tree itself.' See James Gairdner's appendix to his *History of Richard III.* (1878).

Warble-fly. See BOT.

Warbler, a popular name often applied to all the birds of the family Sylviidæ (sometimes called by the French name of Fauvettes), many of which, however, commonly receive other popular names, as the Blackcap, Nightingale, Hedge-sparrow, Redbreast, Redstart, Stonechat, Wheatear, Whitethroat, &c. (q.v.), while many receive the name Warbler with some adjunct—Reed-warbler, &c. The more typical genera comprise birds of small size and plain plumage, usually alike in both sexes; most of them are migratory, going a long way south of their breeding-haunts to winter; for instance, the Siberian Chiff-chaff (*Phylloscopus tristis*) winters in India. Such genera are Sylvia, to which the Blackcap and Garden-warbler belong; Locustella, of which is the Grasshopper-warbler (*L. nævia*), not unfrequent in many parts of England, and found also in the south of Scotland and in Ireland. It is found in most parts of the centre and south of Europe, at least during summer, being a bird of passage. It is of a greenish-brown colour, the centres of the feathers dark brown, producing a spotted appearance; the lower parts pale brown. It is a shy bird, hiding itself in hedges and bushes, but very active, often darting out like a mouse from the bottom of the hedge, and receives its name from its chirping, grasshopper-like note. The genus Acrocephalus has, like the foregoing, a rounded tail; the species frequent watery places, and are known as Reed-warblers. Some of them nearly equal a thrush in size. The Sedge-warbler (*A. schœnobœnus*) is the most common British species, and is generally found in thick patches of reeds or willows in marshes, or in other situations close to water, and where the aquatic herbage is thick and strong. It abounds on the marshy

Reed-warbler (*Acrocephalus streperus*).

banks of the Thames. The Reed-warbler (*A. streperus*) is found in summer in marshy situations in the south of England; it abounds in Holland and in many parts of Europe, and its range extends to the north of India. It is of a uniform pale brown, with a tinge of chestnut; the chin and throat white; the under parts pale buff colour. Its nest is remarkable; it is attached to the stems of three or four reeds, and formed by winding grass or the branches of reed panicles together with a little wool, and is conical and deep, so that the eggs or young may not be thrown out when the reeds are shaken by the wind. The Phylloscopi feed chiefly on small insects and larvæ which infest the foliage of trees; they are small species, and in colour vary above from olive-green to brown, and below from yellow or greenish yellow to white. They build semi-domed nests. The Chiff-chaff (*P. collybita*), so named from its two-noted cry, is a familiar early migrant to Britain. The Wood-warbler, also known as Wood-wren (*P. sibilatrix*), is common in the wooded districts of England in summer, particularly in old plantations of oak and beech. The Willow-warbler (*P. trochilus*) is very common in the south of England in summer, but more rare in northern parts of Britain. It frequents woods, shrubberies, thick hedgerows, and bushes, but

builds its nest on the ground. Asia has many species of warblers, among which some of the European species are included. Australia has many species of warblers, some of which (Malurus) are of very beautiful plumage. See Howard, *British Warblers* (a magnificent work). Numerous species of warblers are found in North America, but these belong to a quite distinct family (Mniotiltidæ) which appear to graduate into the Tanagers (q.v.). They are birds of brighter plumage than the Old-World warblers, but resemble them in their habits, and are also migrants. Not a few of the species are therefore reckoned among the birds of the West Indies, just as some of the European species are found in Africa.

Nest of Reed-warbler.

Warburton, Eliot, was born in 1810 at Aughrim, County Galway, the eldest son of the inspector-general of constabulary in Ireland. He studied at Cambridge, and was called to the bar, but soon devoted himself to literature, travel, and the improvement of his Irish estates. His eight works include *The Crescent and the Cross* (1844), a spirited description of eastern lands; *Memoirs of Prince Rupert* (1849); and *Darien, or the Merchant Prince* (1851). He was sailing for Panamá, as an agent of the Atlantic and Pacific Company, when he was lost in the steamship *Amazon*, burnt off Land's End on 4th January 1852.

Warburton, William, a famous but not a great English divine, was born at Newark, the son of its town-clerk, December 24, 1698. He received his education at Oakham and Newark grammar-schools, and at sixteen was articled to an attorney. He seems to have practised his profession for some years at Newark, while diligently keeping up his studies, and he was ordained deacon in 1723, priest in 1727. Presented by Sir Robert Sutton to the rectory of Brant-Broughton in Lincolnshire, he gave himself here for eighteen years to severe and unbroken study. His *Alliance between Church and State* (1736) first called attention to his powers, but it was *The Divine Legation of Moses* (books i.–iii. 1738; iv.–vi. 1740) which formed the sure foundation of his fame, although Gibbon could describe it in his autobiography as 'a monument, already crumbling in the dust, of the vigour and weakness of the human mind.' His object was to prove the divine authority of Moses, but he wanders discursively into all manner of subsidiary inquiries, and fortifies defects of argument with vulgar abuse of all manner of adversaries, especially in his foot-notes—his 'places of execution.' A characteristic excursion was the explanation of Virgil's descent of Æneas into the shades as an allegorical version of initiation as a law-giver into the Eleusinian mysteries, which called forth the anonymous *Critical Observations on the Sixth Book of the Æneid* (1770) of the yet untried historian Gibbon. The Deists had made much of the absence from the Old Testament of any distinct reference to a future life, but Warburton makes bold to take this itself as a proof of divine authenticity, for no mere human legislator would have omitted such a sanction, and therefore the motive of Moses in leaving out so necessary a condition of morality must needs have been that he expected a further revelation. Of this preposterous work books vii. and viii. never appeared; book ix. was only published posthumously in 1788. It displays no speculative power or profundity of thought, but merely a vigour in verbal logic, and a reading multifarious and vast indeed, but inaccurate. This man has 'monstrous appetite and bad digestion,' said Bentley. Insolent, dogmatic, arrogant beyond belief, prone to paradox, devoid of any spiritual insight, intolerant of any difference of opinion, he brings to theological controversy the habits of mind of the attorney's office, brow-beating his opponents with abuse and imputation, reading, says Leslie Stephen, the Bible precisely like an act of parliament. In a series of letters in the *Works of the Learned* for 1739 he voluntarily defended the orthodoxy of Pope's *Essay on Man* in answer to Crousaz, and the poet was so grateful at being proved to be not a fatalist that he rewarded his boisterous apologist with a close and unbroken friendship, leaving him at his death in 1744 his literary executor—a bequest which Johnson estimated at £4000. This friendship also gave him an introduction to the wealthy owner of Prior Park, Ralph Allen, whose favourite niece, Gertrude Tucker, he married in 1745. Warburton's preferment was now rapid: he became successively Preacher of Lincoln's Inn (1746), Prebendary of Gloucester (1753), King's Chaplain (1754), Prebendary of Durham (1755), Dean of Bristol (1757), finally, through the nomination of Allen's warm friend, William Pitt, Bishop of Gloucester (1759). He was remiss in his episcopal duties, but the standard of that age was not high, and Hurd, who had the honesty to be as obsequious in his flattery to him dead as living, counts the loss to his diocese gain to the church. The grace of apostolical succession did not drive out his fighting spirit, and he wore out his days in endless warfare with Hume, Jortin, the Deists wholesale, Voltaire, Lowth, and Wesley. The most famous of these struggles was that with Lowth, who was as much his superior in scholarship as in courtesy. Lowth's famous *Letter* (1765) remains scarce rivalled to this day in polite raillery and point, and Warburton for once had the prudence to offer no retort. His *Doctrine of Grace* (1762) was a weak attack on Wesley, to which both Whitefield and Wesley made a satisfactory reply. Warburton's mental powers did not last out his life, and the loss of his only son in 1755 was a trial from which he never recovered. He died June 11, 1779, and was buried in his cathedral. His widow in 1781 married a former chaplain, John Smith.

Warburton in his early years had aided Theobald in his Shakespeare, and in 1747 he himself issued an edition which brought him no credit, for Douce was within the truth when he called him of all Shakespeare commentators 'surely the worst.' His chief remaining works were the credulous enough *Julian* (1750), on the renegade emperor's attempt to rebuild the temple at Jerusalem, *à propos* of Middleton's *Inquiry concerning the Miraculous Powers of the Early Church;* his edition of Pope (1751); *The Principles of Natural and Revealed Religion,* sermons (3 vols. 1753–54–67). A sumptuous edition of his works was published in 1788 by his jackal, Bishop Hurd, in seven quarto volumes, at the expense of his widow; a more recent edition is in 12 vols. (1811). —His name survives in the Lecture he founded at Lincoln's Inn with £500 in 1768.—See the Lives by F. Kilvert (1860) and J. S. Watson (1863), also Leslie Stephen, *History of English Thought in the Eighteenth Century* (1876), Mark Pattison's *Essays* (vol. ii. 1889), Sir J. F. Stephen's *Horæ Sabbaticæ* (vol. ii. 1892), and Collins, *Typical English Churchmen* (1902); Kitchin, *Seven Sages of Durham* (1911).

Ward. See GUARDIAN, CHANCERY.

Ward, SIR ADOLPHUS WILLIAM (1837–1924), born at Hampstead, had his education in Germany, and at Peterhouse, Cambridge, becoming a fellow in 1860. In 1866 he became professor of History and English Literature at Owens College, Manchester, its principal in 1889, and in 1900 Master of Peterhouse. He translated Curtius's *History of Greece* (5 vols. 1868–73), and wrote a profoundly learned and invaluable *History of English Dramatic Literature* (1875; new ed. 1899). Other works are books on Chaucer, Dickens, and Sir Henry Wotton; editions of Pope, John Byrom's poems, Crabbe, Mrs Gaskell, &c.; Marlowe's *Faustus* and Greene's *Friar Bacon; The Counter-Reformation* (1888); *Great Britain and Hanover* (1899); *The Electress Sophia and the Hanoverian Succession* (1903); *History of Germany, 1815–90* (3 vols. 1916–18); *Collected Papers* (4 vols. 1921). He was one of the editors of and contributors to the 'Cambridge Modern History,' the 'Cambridge History of English Literature,' and the 'Cambridge History of British Foreign Policy.' He was knighted in 1913. See A. T. Bartholomew's *Bibliography* with a memoir by T. F. Tout (1926).

Ward, ARTEMUS. See BROWNE (C. F.).

Ward, EDWARD MATTHEW (1816–79), historical painter, was born in London, and studied there, at Rome, and at Munich. He became A.R.A. in 1847 and R.A. in 1855. His greatest successes were obtained by his 'Dr Johnson in the ante-room of Lord Chesterfield' and other pictures of English social life in the 18th century. In 1853 he painted eight historical pictures for the corridor of the House of Commons. See *Life* by Dafforne (1879) and his widow's *Reminiscences* (1911).—His son SIR LESLIE WARD (1851–1922), caricaturist, was 'Spy' of *Vanity Fair* (1873–1909), and was knighted in 1918. See *Forty Years of 'Spy'* (1915).

Ward, DAME GENEVIEVE, prima donna and tragic actress, was born at New York, 27th March 1837. As a girl she travelled much in Europe. She married a Russian count, and left him at the church door. Under the name of Ginevra Guerrabella she made her début at the Scala in Milan in *Lucrezia Borgia* in 1856. After a triumphant progress through Europe and America her singing voice gave out. She then took to tragedy and management, and from 1893 played with Irving. She excelled as Volumnia in *Coriolanus*. She still played occasionally till about two years before her death, 18th August 1922.

Ward, MRS HUMPHRY (1851–1920). Mary Augusta Arnold was born at Hobart in Tasmania, eldest daughter of Thomas Arnold (1823–1900), second son of the great Dr Arnold of Rugby. Her father, becoming a Roman Catholic, resigned his place as inspector of schools, and returned to England in 1856 to become professor in the Roman Catholic university at Dublin. Afterwards in the Oratory School at Birmingham and at Oxford, he wrote a serviceable *Manual of English Literature* (1862), and edited *Select English Works of Wyclif* (3 vols. 1869), *Beowulf* (1876), and for the Rolls series Henry of Huntingdon (1879) and Symeon of Durham (1882–85). Together with the Rev. William E. Addis he edited the well-known *Catholic Dictionary* (1883). In 1872 Miss Arnold married Thomas Humphry Ward (1845–1926), tutor at Brasenose, Oxford (1870–80), art critic, editor of *The English Poets* (5 vols. 1880–1918), *Men of the Reign* (1885), *Men of the Time* (12th ed. 1887), and *The Reign of Queen Victoria* (1887). She began early to contribute to Smith and Wace's *Dictionary of Christian Biography*, but her great success was made in the widely read spiritual romance of *Robert Elsmere* (1888). The book was an attempt to represent the struggle of a soul in its voyage towards newer theistic aspirations after losing the landmarks of the old faith. Profound spiritual insight, broad human sympathy, and strong thinking are manifest throughout, but as a work of art it is marred by didactic persistency. Succeeding novels include *David Grieve* (1892), *Marcella* (1894), *Helbeck of Bannisdale* (1898), and *Eleanor* (1900), which deal with aspects of modern Catholicism; *Marriage of William Ashe* (1905), *Case of Richard Meynell* (1911), while a volume of *Recollections* appeared in 1918. *Harvest* was a posthumous work. Mrs Ward was a founder (1890) of University Hall as a centre of liberal religious thought. See Life by her daughter, Janet Penrose Trevelyan (1923).

Ward, JAMES (1769–1859), animal painter and engraver, was born in London, was apprenticed to his elder brother, a mezzo-tint engraver, was influenced in his painting of *genre* by Morland (q.v.), his brother-in-law, but with his 'Bull-baiting' (1797) turned with great success to animal painting, and later to landscapes and portraits. He was elected A.R.A. in 1807, R.A. in 1811.

Ward, JAMES (1843–1925), English philosopher and psychologist, born at Hull and educated at Liverpool, worked with a firm of architects and preached in the congregationalist ministry before going through a distinguished course at Trinity College, Cambridge. A Fellow of Trinity in 1874, he became lecturer in Moral Science in 1881 and professor of Mental Philosophy and Logic at Cambridge in 1897. Trained in physiology and theology at German universities, Ward was also considerably attracted by the new movements in biology, and brought his keen intellect to bear on the field of psychology. His writings on that subject, especially his article to the *Encyclopædia Britannica* (9th, 10th, and 11th editions), were profoundly influential in its establishment as a science in England. The article in question, revised and supplemented, was published in 1918 as *Psychological Principles*. He was twice Gifford lecturer, his lectures (*Naturalism and Agnosticism*, 1899; *The Realm of Ends*, 1911) being considered valuable contributions to the theistic cause. Ward published a *Study of Kant* in 1922. His *Essays in Philosophy* appeared posthumously, edited by Professors Sorley and Stout, with a memoir by Olwen Ward Campbell.

Ward, LESTER. See SOCIOLOGY.

Ward, NATHANIEL BAGSHAW (1791–1868), botanist and inventor of the 'Wardian Case' for the transport of delicate ferns and other such plants, or for keeping them indoors—a close glass case fitted accurately on a tray containing soil.

Ward, WILLIAM GEORGE (1812–82), son of a London merchant and financier, studied at Winchester and Oxford, followed Newman in 1838, defended Tract XC., and, writing *The Ideal of a Christian Church* (1844), on Roman Catholic lines, was nicknamed 'Ideal Ward,' and deprived of his degree. He became professor of Philosophy in the Roman Catholic College at Ware, and editor of the *Dublin Review*, opposed Newman's scheme for liberalising Catholic education, and in his controversial treatises maintained papal infallibility.—His son WILFRID PHILIP (1856–1916), born at Ware, became lecturer in philosophy at Ushaw College in 1890, and editor of the *Dublin Review* in 1906. He wrote lives of his father, of Wiseman and Newman, and books and articles on Catholic subjects. His *Last Lectures* (1918) were prefaced with a biographical notice by his wife.

Warden, an officer appointed for the naval or military protection of some particular district of country. To keep the districts of England adjoining

Scotland and Wales in a state of defence, Lords Wardens of the Marches were appointed. See BORDERS; also CINQUE PORTS, STANNARIES.

Wardlaw, ELIZABETH, LADY, Scottish poetess, was born in 1677, the second daughter of Sir Charles Halkett, Bart. of Pitfirrane. She married in 1696 Sir Henry Wardlaw, Bart. of Pitreavie, also near Dunfermline, and died in 1727. Her pseudo-archaic ballad, *Hardyknute, a Fragment*, was first published in 1719 as a genuine antique, and had been expanded from 216 to 336 lines, when Percy in the second edition of his *Reliques* revealed the secret of its authorship. To Lady Wardlaw also Dr Robert Chambers in 1859—imprudently—ascribed 'Sir Patrick Spens,' 'The Douglas Tragedy,' and others of our finest traditional ballads.

Wardlaw, RALPH (1779–1853), born at Dalkeith, studied at Glasgow, and settled as Congregationalist pastor there; becoming also professor of Theology to the Congregational body in Scotland. A powerful preacher and vigorous controversialist, he wrote on Socinianism, Ecclesiastes, the Sabbath, the Atonement, Miracles, and Congregationalism.

See the Memoir by Dr W. L. Alexander (1856).

Wardship, in English feudal law, was the guardianship which the feudal lord had of the land of his vassal while the latter was an infant or minor. Until the majority of the infant the lord, out of the profits, provided a fit person to render the services incumbent on the vassal. In the case of a female ward, he could dispose of her hand in marriage. See TENURE, FEUDALISM.

Ware, a market-town of Herts, on the Lea, 2½ miles ENE. of Hertford. It has a fine cruciform church, remains of a priory (1233), great malting establishments, and memories of Godwin and 'John Gilpin.' St Edmund's Catholic College (1769), with a chapel of 1850 by Pugin, is at Old Hall Green, 5 miles NNE.; and the great Bed (q.v.) of Ware was in 1869 removed to Rye House. Pop. of urban district, 6000.

Wareham, a small but very ancient market-town of Dorsetshire, stands between the rivers Piddle and Frome, 15 miles E. of Dorchester. It was a British town, and afterwards a Roman station, and is surrounded by a vallum or grassy earth-wall, which is still about 30 feet high, and is perfect on three sides. A fire destroyed two-thirds of it in 1762, and a Norman castle and a priory have disappeared; but St Mary's Church retains an interesting chapel, that marks the resting-place for two years of Edward the Martyr. Superseded by Poole as a port, Wareham now depends chiefly on extensive clay-works. It is a municipal borough, and till 1832 returned two members, then till 1885 one (with Corfe Castle, Arne, &c.). Horace Walpole is claimed falsely as a native. Pop. 2000.

Warehousing. See BONDED WAREHOUSES.

Warham, WILLIAM, Archbishop of Canterbury from 1503 to 1532, was born about 1450 at Church Oakley in Hampshire, and was educated at Winchester and New College, Oxford. He took holy orders, but also practised law, and became advocate in the Court of Arches and moderator of the Civil Law School in St Edmund's parish, Oxford. He became known to Henry VII., and was attached to an embassy to the court of Burgundy. His services in connection with Perkin Warbeck's pretensions to the crown obtained for him rapid preferment in church and state, and he was soon Master of the Rolls (1494), Lord Chancellor (1503), Bishop of London (1503), and Primate (1503). He fell into disfavour with Henry VIII., and in 1515 resigned the great seal to Wolsey. He was a close friend and favourer of the New Learning and of its apostles in England—Erasmus, Dean Colet, Grocyn, and Linacre—but had no stomach for fundamental reform. He listened to the ravings of the Maid of Kent, but had no pity for heretics and translators of the Scriptures. With regard to the divorce he passively supported the king, and he agreed to recognise the king's supremacy. He died 22d August 1532. See vol. vi. of Hook's *Lives of the Archbishops* (1868).

Warkworth, a small seaport in Northumberland, near the mouth of the Coquet, 7 miles SE. of Alnwick by rail. The interesting castle, mostly ruinous, dates from the 12th century, and is often named in the history of the Percies (as in Shakespeare's *Henry IV.*). In 1922 it was presented to the nation by the Duke of Northumberland. The Norman church has been restored. The Benedictine priory was founded in 1256, and the hermitage 'deep hewn within a craggy cliff,' and known from Bishop Percy's ballad, is about a mile above the castle.

Warming. Warm-blooded animals require for health a certain temperature of the body, variable only within certain limits. If the external temperature become too high, the temperature of the body is regulated by perspiration and respiration; if it become low the bodily activity is increased, and the temperature thus kept up. Under ordinary circumstances, however, man needs to protect himself against excessive cooling, in order that he may lead the comparatively quiescent life of civilisation; he needs houses and clothing. If this precaution be neglected his vitality sinks; and as the external temperature falls the death-rate rises, which shows that there is a certain amount either of neglect or inability, or both, to take the measures necessary to avoid undue cooling of the body. This undue cooling may be avoided in two ways—by extra clothing or by artificial heating of apartments. In southern Europe and in China the former is the plan resorted to; in countries where fuel is not scarce the latter plan, which is preferable, is adopted.

The objects of artificial heating are the temperature most congenial to the human constitution, pure air to breathe, and air not too warm or dry. If the body be kept sufficiently warm the air which we breathe may be fairly cool; and an ideal system of warming would warm the body and leave the air cool and pure. The actual methods of warming are, to a greater or less extent, compromises, and they depend mainly either upon radiation of heat or upon convection of heat, or both. The former method is that of the open fire; the latter is, in the main, that of stoves, gas, steam, and hot water. In the former the walls and furniture of the room are warmed, while the air is not warmed directly by the fire, for the radiant heat streams through it without warming it; in the latter the air itself is warmed directly. In the former the walls are, so far as the fire is concerned, warmer than the air; in the latter the reverse is the case. In the former (the open fire) there is no tendency to deposition of moisture from the air upon the walls, unless the air becomes laden with excess of moisture from extraneous causes, such as the presence of a numerous assemblage, or unless the air becomes chilled and deposits its moisture even upon somewhat warmer walls; in the latter case, the walls being cooler than the air, there is a continuous tendency to the deposition of moisture on the walls, unless the air is at some distance from its saturation point. Heating by radiation is best exemplified by the open fire with a chimney or in the open air. The drawbacks of the open fire burning in a grate are the waste of fuel through imperfect combustion, the production of smoke, the comparatively small radiative power of flame (a blazing fire having less effect than a glowing one), the

warming of surrounding objects on one side only, the want of an equably maintained temperature, and the waste of heat, which escapes with the smoke and chimney-gases. Its advantages are the satisfaction of the eye, cool air to breathe, and the ventilation produced. Smoke may be diminished and radiation increased by an extended use of coke; but coke does not do well if the fire burns low, and a blower should be used to make the fire draw quickly and become bright. A forced draught should always be used for a few minutes while lighting a fire; the amount of smoke produced is very materially diminished by this means. The forced draught is secured by narrowing the front aperture so that all the air which reaches the chimney must have passed through the fuel. If the aperture in front of the fire be large, air passes up to the chimney in front of the fire-gases, and the combustion is relatively slow. Dr Arnott (q.v.) developed the principle of limiting the access of air to the fuel by enclosing a store of fuel in an iron box beneath the grate, and bringing this gradually to the top by pushing up a false bottom; the air got access to the fire only at and near the top, and if the fire were left to itself it smouldered for many hours, ready to brighten up when it was pushed up so that air might gain freer access to it. In tending a fire it ought to be borne in mind that when the fire cannot radiate light it cannot radiate heat, and that it is therefore absurd to hide the fire under opaque masses of coal; and secondly, that the products of distillation of coal ought not to be allowed to escape as black smoke, but should pass up through a bright portion of the fire, and be perfectly burned. In special hearths it is possible, by means of false bottoms, to introduce fresh charges of coal underneath the existing fire so that the outer surface of the fire is always clear and bright. Even in ordinary grates it is possible to do a good deal towards minimising smoke and confining the active portion of the fire to the top and front; if, for example, a tile be fitted in the bottom of the grate; if a substantial amount of fuel be put in the grate and lit at the top; if this fuel contain some broken coke or cinder; if fresh fuel be added, not by throwing it on the top, but by raking the fire forward, throwing the fresh fuel into the hollow thus produced at the back of the fire, and then pushing the bright fire back upon it; if these things be done the fire is obviously brighter and more continuously cheerful and more nearly smokeless. The fire should always be bounded by fire-brick behind and on each side, for iron chills and blackens it. The fire-gases should not be allowed to escape at once into the chimney up a sloping iron back; but the back of the grate should be fire-brick all the way up, and should overhang the fire so that the ascending fire-gases impinge on it; by this means the 'throat' of the chimney is prevented from being excessively wide, the back-brick absorbs heat from the fire-gases and radiates it towards the floor, and the back-brick also reflects towards the room the heat radiated upwards from the top of the fire. For similar reasons the regulator or register should slope forwards. In every case, however, where there is flame there is great loss of heat, which escapes up the chimney, and even where the fire is smokeless this loss is considerable. The heat which is radiated into the apartment is never more than a fraction of the total heat of combustion of the fuel; and plans have been devised (see VENTILATION) for recovering some of this heat by causing it to warm the air which is supplied to the apartment.

In the more primitive plans in which there is no ventilation—an open fire in a cave, a tent, a wigwam, or a cabin, or a charcoal brazier in a room with a chimney, or a gas or petroleum stove isolated in a room—the whole heat of combustion of the fuel may be utilised in warming the walls and air of the room; but the products of combustion vitiate the air. Warming of this kind is effected by gas-burners and petroleum-lamps, which raise the temperature very considerably in non-ventilated rooms, but seriously vitiate the air at the same time.

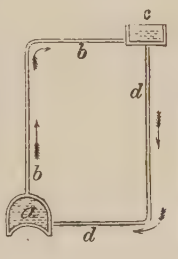
By the use of close stoves the actual vitiation of the air by products of combustion is in great part avoided. The Dutch stove, for example, is a hollow cylinder or other form of iron, standing on a stone slab on the floor, close at the top, and having bars at the bottom on which the fire rests. The door by which the coals are put in being kept shut, the air for combustion enters below the grate; and a pipe issuing from near the top carries the smoke into a flue in the wall. If this pipe be made long enough the fire-gases traversing it may be very materially cooled down before they enter the chimney, and thus the bulk of the heat of combustion remains in the room. As far as mere temperature is concerned, this is a most effective and economical warming arrangement; but it has serious faults. The iron often becomes red-hot or even hotter; any carbonic oxide existing inside as the result of an inadequate draught passes through hot iron and acts as a slow poison, causing anæmia; the dust in the air is charred when it approaches the hot metal, and gives rise to offensive and unwholesome odours; the air is rendered very 'dry' by being strongly heated. These faults are more or less obviated by increasing the mass and the cooling surface of the stove so that it cannot become too hot externally when a moderate fire is kept up within; by regulating the fire; by adjusting the fire-capacity of the stove itself; by allowing the access of sufficient air to ensure complete combustion; by surrounding the fire with brick instead of iron, or building the whole stove of brick or earthenware; and by placing a vessel of water upon the stove, the water evaporated from which may supply the moisture necessary to bring the air to a congenial degree of saturation, appropriate to its new temperature. If this vessel of water be placed upon the stove the air takes up moisture from the evaporating pan, and does not then parch the skin and lungs; but when the room cools down again the air may readily prove supersaturated, and deposit moisture on the walls, a condition favourable to mould.

In most Continental stoves the fire is surrounded by a mass of brick, lined externally with porcelain The smoke goes along a winding passage in the structure and issues nearly cold. The brickwork becomes warmed, and keeps up a moderate heat for a long time after the fuel has burned out. Open-fire stoves have also been devised; and an open fire-grate might be built out into a room at a distance from the wall, and the flue might go at once into the chimney, or go up an ornamental column through the room above. By such means the waste heat of the chimney would be utilised in warming the air of the apartments.

Gas-stoves have come into considerable vogue of late years. They depend either upon radiation from luminous flames or from asbestos heated by Bunsen burners, or upon heating of a metal casing by Bunsen burners with or without direct contact between flame and casing. Bunsen flames are in themselves of no use for pure radiation, and bare flames without ventilation simply heat the air by pouring hot water-vapour and carbonic acid into it, as any other fuel would do. In gas-stoves as much as in open fires the products of combustion, though they are invisible, must be taken out of the room, and the means of access of these products to the chimney must be ample. The air of apartments is also

frequently warmed by steam or hot-water pipes: these are iron pipes containing hot steam or hot water, and warm externally by reason of the heat-conductivity of the metal. Air coming in contact with them is warmed and ascends, its place being taken by cooler and heavier air, which in its turn ascends. The whole air thus becomes warmed. Radiation from the pipes is also favoured by a coat of paint, not by a smooth metallic surface. These systems lend themselves readily to distribution of heat throughout a building from one central fireplace. The pipes can be so arranged that the steam or water can be shut off from any part at will; and the tubes may, by being connected with or attached to plates or wings of metal, have their heating surface and their heating efficiency increased. Steam heating is useful where there is waste steam available, as in factories and railway trains. As long as steam goes on condensing it remains at 212° F. (100° C.) until it is wholly converted into water at 212° F.; overheating is thus not possible unless the steam is itself superheated at a high pressure. The pipes must be so laid, in the case of a building, that all condensed water may flow back into the boiler, and allowance must be made for expansion of the pipes by heat. When hot water is employed it may be made to circulate either at low pressure or at high pressure.

In low-pressure systems the arrangement may be illustrated by the figure, in which *a* is a boiler; *b* is a tube which circulates through the building; *c* is a small tank at the top of the circuit and open to the air, by which the tubes and boiler are kept full; *d* is the return tube. When the boiler is heated the heaviest portion of the water within the system, the cool water in *d*, tends to sink by gravity to the lowest level, and thus circulation is immediately set up, and kept up as long as the boiler maintains a difference of temperature. The portion of the pipe which contains the coldest water should be vertical, and the comparative coolness of the water in the return pipes is maintained by the loss of heat experienced by the water on its way round the building. In high-pressure systems the pipe is narrower and very strong (wrought-iron of special make and thickness), and it forms a closed endless coil throughout the building. It is completely filled with water, except at the top, where there is a strong closed cylinder (the 'expansion-pipe') containing air to provide for the expansion of the water by heat. The pipe is led in a 'boiler coil' round a fire at the basement. The water circulates for the same reason as in the low-pressure system, but it travels very rapidly, since the water can be heated in the boiler coil to temperatures far exceeding 212° F. This is because the whole apparatus is equivalent to a closed vessel, capable of standing great pressures, and in such a vessel water may be highly heated without attaining a boiling-point. The apparatus is tested for pressures of 2000 to 3000 lb. per square inch, and at 750 lb. pressure it would be possible to heat the water to 510° F. The usual heat employed is from 300° to 350° F., which corresponds to a pressure of from five to nine atmospheres.



The advantages of the high-pressure system are the use of smaller pipes, which are more convenient and more seemly; the possibility of making them dip without risk of the bends being blocked by air (the removal of which must, on the low-pressure system, be provided for and attended to); the ease of application of radiating surfaces to the smaller tubes; the yielding of the system by alternate compression and release of the air in the expansion-tube, which acts as an elastic cushion and tends to prevent fracture; the small quantity of water used, the rapidity of circulation and the consequent promptness of action; the freedom from any access of dirt to clog the tubes; and the advantageous form of the boiler-coil as a rapid heater. The disadvantages are the quick cooling down when the fire goes down and the want of uniformity of temperature when the fire fluctuates, the uncomfortable heat of the pipes when touched, the fact that the pipes must be kept at a greater distance from plants, the slight charring of dust in the air, the slight charring of some kinds of wood laid too near the pipes, and the greater chance of freezing if the fire goes out. For the last reason the pipes should be charged not with water but with a non-freezing solution. In a modification of the system specially applicable to cases in which portions of the system are to be shut off from time to time, there are outlet and inlet safety valves to let hot water out or cold water in when the pressures are greater or less than certain limiting values. In that case the expansion-pipe is often dispensed with. In these cases the air which is in the room is heated. The heating of air to be brought into a room will be found under VENTILATION.

Small spaces may sometimes be warmed by the introduction of hot water, as railway carriages by hot-water tins. Better than hot water is a tin case filled with crystallised acetate of soda; this is exposed to heat until it becomes warm; the heat absorbed is partly expended in melting the acetate, which then dissolves in its own water of crystallisation; the mass therefore absorbs much heat; and as it cools down it keeps on liberating its latent heat for a protracted period.

As to conserving the warmth of a room by preventing heat from escaping, the leading methods are to make the walls, doors, &c. bad conductors and air-tight. Air-tightness is incompatible with ventilation, but bad conduction is desirable both in winter and summer. The best material for a badly-conducting wall is one of a porous or spongy texture, such as porous stone or brick, which contains air in its interstices; but the best structural form is that which contains a film or jacket of air. Even iron houses may be made warm in winter by this means, if plaster-lined. Windows, again, if made double—double panes or, better, double sashes—allow very much less heat to escape than single ones, and even window-blinds and curtains have to a smaller extent the same action. The intervening air-film or layer is prevented from flowing away, and it is a very bad conductor.

As regards warming and heating by electricity, the fundamental datum is that one commercial unit of electric energy (=1000 Ampère-volt hours) liberates while passing as many heat-units as ·253 lb. of good house coal does on complete combustion. If all the heat units in each case could be applied to the purposes of warming, electric current at x pence per unit would be equivalent, as regards cost, to house coal at 8853·75 x pence per ton. But suppose, by way of example, that the current was used in appliances which introduced into the room 80 per cent. of the heat units derivable from the energy recorded on the electricity meter, while the coal was used in open fires which radiated into the room only some 5 per cent. of the heat units derivable from the coal, we would then have electricity at x pence per unit equivalent in cost to coal at $\frac{100}{80} \times \frac{5}{100} \times 8853{\cdot}75\ x = 553{\cdot}36\ x$ pence per ton. Again, electricity can be used only when and as required, and can further be concentrated in the heating work to be done; for example, a resistance

coil bearing a current, which in the open air becomes red-hot or white-hot, will, if immersed in cold water, rapidly bring the water to the boil without any temperatures being attained above 212° Fahr.

Warming, JOHANNES EUGENIUS BÜLOW, botanist, born in the North Frisian island of Manö, 3d November 1841, studied at Copenhagen and Bonn, with an interval in Brazil, and was professor of botany at Stockholm (1882–85) and at Copenhagen (1885–1911). He travelled in Greenland, Norway, Venezuela, and the West Indies. He did important work in plant morphology and classification. His *Handbog i den Systematiske Botanik* (1879) is famous; and by his *Plantesamfund* (1895; trans. as *Œcology of Plants*, 1909) he became a founder of Ecology (q.v.). He died 1st April 1924.

Warminster, an ancient residential town of Wiltshire, on the west border of Salisbury Plain, and 19½ miles NW. of Salisbury. It has an early 14th century church; a town-hall (1831); a free school (1707), at which Bishop Hampden and Dr Arnold were pupils; and a theological college (1860). The present market and the pleasure grounds (8 acres) are of recent date. The Marquis of Bath's seat, Longleat, 4½ miles SW., is one of the noblest Elizabethan mansions in the kingdom, with a fine collection of portraits, memories of Bishop Ken, and a magnificent park. Pop. 5400.

Warneck, GUSTAV (1834–1910), theologian, was born at Naumburg in Germany, studied at Halle, and became pastor (1874), and professor at Halle (1897). Editor of a *Missions-Zeitschrift*, he wrote many books and papers on missions, those translated into English being *Modern Missions and Culture* (1883) and *Outline of the History of Protestant Missions* (1884).

Warnefried. See PAULUS DIACONUS.

Warner, CHARLES DUDLEY, American author, was born at Plainfield, Massachusetts, 12th September 1829, graduated in 1851 at Hamilton, and in law at the University of Pennsylvania in 1856, practised in Chicago till 1860, and then settled as an editor at Hartford. In 1884 he became co-editor of *Harper's Magazine*, to which his papers on the South, on Mexico, and the Great West were contributed. In 1873 he wrote with 'Mark Twain' *The Gilded Age;* he had then published *My Summer in a Garden* (1870) and *Back-log Studies* (1872). Other works are *Being a Boy* (1877), *Washington Irving* (1881), *Captain John Smith* (1881), *In the Levant* (1893), &c. He died suddenly at Hartford, 20th October 1900.

Warner, SUSAN (1819–85), authoress, born at New York, published under the pen-name of Elizabeth Wetherell her first novel, *The Wide, Wide World*, in 1851. It proved, next to *Uncle Tom's Cabin*, the most successful of American stories, and owes nothing to its subject or its incidents or its literary worth. *Queechy* followed in 1852, *The Hills of Shatemuc* in 1856, *The Old Helmet* in 1863, *Melbourne House* in 1864, *Daisy* in 1868, and *A Story of Small Beginnings* in 1872. Her other works were mostly religious. She died at Highland Falls, New York. See her Life (1909) by her sister, Anna Bartlett Warner ('Amy Lothrop'; 1820–1915), who collaborated with her and wrote popular stories of her own.

Warning Coloration. See MIMICRY.

Warnsdorf, or VARNSDORF, a town of Bohemia, on the Saxon frontier 60 miles N. by E of Prague, is an important textile centre; pop. 20,300.

War Office. See WAR.

Warping, a method of improving land by distributing on it, by embankments, canals, flood-gates, &c., the alluvial mud brought down by rivers.

Warrant, an authorisation from the proper authority to a person to do something which he has not otherwise a right to do. The more formal warrants are under the hand and seal of the person granting them. The kinds of warrants are innumerable—informal instruments authorising a person to receive money or goods, such as dock-warrants, dividend-warrants, share-warrants, and formal legal warrants used in civil and criminal cases. Warrant of attorney is dealt with at ATTORNEY. The more important judicial warrants are the bailiff's-warrant, the sheriff's authorisation to a bailiff to execute a writ; the warrant to answer, issued by a justice of the peace, for the apprehension of a person accused of an indictable offence; the bench-warrant, issued by the court before which an indictment has been found, to arrest the accused; and the warrant of deliverance, for discharging from prison a person who has been bailed. General warrants, issued against no one person named, but against all persons suspected, were formerly in use, and proved an instrument of oppression; in the case of Wilkes, such a general warrant issued by a secretary of state to search for and seize the papers of the author (not named) of a seditious libel was decided to be illegal. In Scotland, after the declaration of an accused person has been made, if there be reasonable grounds of suspicion against him, the magistrate grants a warrant, the warrant of commitment, sending him to prison to abide the result of his trial. By statute 1701, chap. 6, this warrant must be in writing and duly signed; it must specify the particular offence charged, and must proceed on a signed information. There are, further, the distress-warrant, issued for raising a sum of money upon the goods of a party specified in the warrant; and the search-warrant, granted by a justice of the peace to a constable to enter the premises of a person suspected of secreting stolen goods, or of keeping gunpowder, nitro-glycerine, liquors, &c. contrary to law. Contrary to a common impression, no special warrant is required for capital punishment, the so-called death-warrant being simply the calendar of the prisoners' names, with their punishments on the margin, signed by the judge. In the United States warrants must not issue save on probable cause, supported by oath or affirmation, describing the person to be arrested or place to be searched. See ARREST, CRIMINAL LAW.

Warrant-officers. The highest ranks to which seamen in the Royal Navy under ordinary circumstances used to attain were those of warrant-officer and chief warrant-officer, divided into three classes—gunners, boatswains, and carpenters, the gunners taking precedence of the other two. Of late years the pay and position of warrant-officers have been greatly improved, while their sphere of duties has been much enlarged. Formerly, before ironclads superseded wooden ships, there was only one officer of this rank of each class carried on board even the largest ships. Now, in addition to the officer of each class appointed to carry out the special duties of gunner, boatswain, and carpenter, there are usually three or four junior gunners or boatswains appointed to perform what are called quarter-deck duties; in addition to these in many of the larger ships an extra gunner or boatswain is appointed for torpedo-duties. The rank of warrant-officer is now given to all branches in the navy except officers' stewards and some artisan ratings. A proportion of these officers who have duly qualified in navigation are now appointed to command torpedo boats, and in war-time they have been largely employed on that service. The warrant-officers of the present day are for their station a most highly educated and most efficient body of men. In 1887 two of this rank were promoted to lieutenants for distinguished service before the enemy during

the Egyptian war of 1882–85; and under the orders in force since 1914 a considerable number of appointments with commissioned rank as mates have been opened to warrant-officers. Warrant-officers rank with, but before, midshipmen and with second-lieutenants in the army; chief warrant-officers with, but after, sub-lieutenants in the navy and lieutenants in the army. For Warrant-officers in the army, see NON-COMMISSIONED OFFICERS.

Warranty, in English law, is a promise to secure a person in the enjoyment of a right transferred to him. According to ancient rules of procedure, a person whose title was questioned might vouch another to warranty—i.e. call upon him to make good the guarantee he had given; the vouchee on his appearance stepped into the place of the original defendant. As applied to land the term is now obsolete, but in the mercantile law warranties are still of great importance. On a contract of sale, e.g., the general rule is *caveat emptor*—let the buyer look to himself: a person who sells a thing in its natural state, having no better means of information than the purchaser, is not taken to warrant the quality of the article; he is not liable to make good any defects unless he has been guilty of fraud or dishonest concealment. But where the purchaser has to rely on the vendor the law will generally imply a warranty. Thus, a person selling goods for a particular purpose is usually taken to warrant that they are suitable for that purpose; a dealer in provisions, for instance, warrants them to be wholesome and fit for food. If the goods are unsuitable, it sometimes happens that the purchaser has two courses open to him: he may reject the goods as not corresponding to the contract, or he may accept the goods and sue the vendor for damages for breach of warranty. On a sale by a manufacturer, he is taken to warrant that the goods are of his own manufacture, unless the usage of trade is to the contrary; on a sale by sample there is an implied warranty that the bulk corresponds to the sample in quality and condition. A seller is held to warrant his right to sell; if he is not in fact the owner of what he sells he may have to pay damages if the true owner claims the property from the purchaser; but a seller with a doubtful title may protect himself by agreeing to transfer such rights as he has. The rule of law is sometimes expressed by saying that a seller is not liable in respect of patent defects (i.e. such as the buyer might discover by the exercise of his own judgment), but only for latent defects (i.e. defects known to the vendor which the purchaser has no means of discovering). A warranty must of course be carefully distinguished from a mere expression of opinion about the thing sold. An agent or servant has no right to give a warranty unless he is authorised to do so. On the sale of a horse, the purchaser must make proper inquiry and investigation; if the horse turns out restive or unmanageable, he cannot recover damages unless the seller has given him an express warranty to the contrary.

Unsoundness in horses is a relative term, and difficult to define; but the rule is that, if at the time of sale the horse has any disease which either actually does diminish its natural usefulness so as to make it less capable of performing the work it is intended for, or which in an ordinary course may hereafter diminish its usefulness, or if either from disease or accident it has undergone any alteration of structure that either actually at the time does, or may in its ordinary course, diminish the animal's usefulness, such a horse is unsound. Veterinarians of experience recognise two conditions under the term *sound*, and two converse ones under that of *unsoundness*. The first is recognised under the appellation of 'legally sound,' and is thus defined by Baron Parke. 'I think the word sound means what it expresses—viz. that the animal is *sound* and free from disease at the time he is warranted.' Now experience is opposed to this, as many, perhaps the majority, of horses have evidence of disease or of the results or products of disease or accident in some part or parts of the body; or they may have some infirmity, such as being slight 'roarers' or whistlers, or have slight stringhalt, which renders them legally unsound. Such horses if warranted sound are returnable; but they may nevertheless be what is termed serviceably sound—that is to say, fit to perform the work for which they are bought. Or again, a horse may have a bone spavin; now a bone spavin is looked upon as a disease, and a spavined horse is considered unsound. But if he is free from lameness and have good hock action, in the opinion of many veterinarians he is serviceably sound. And pathological investigation has confirmed this view, for it has discovered that the enlargement—the bone spavin or exostosis—is composed of reparative material, by which the actual disease has been cured. Then again there are what are denominated 'hereditary unsoundnesses,' and the following are officially recognised by the Boards of Agriculture and leading agricultural societies: roaring and whistling, bone spavin, side-bones and ring-bones, stringhalt, shivering, cataract, navicular disease, and defective genital organs.

Guaranty (q.v.), etymologically the same word as warranty, has a different sense in law.

Warren is a place kept for the purpose of breeding game or rabbits. In its strict legal sense a right of free warren (extending to hares, rabbits, partridges, pheasants, and sometimes quails, woodcocks, and water-fowl) can only be derived by grant from the crown, and gives certain privileges to the warrener as to recovering game and destroying dogs which infest it.

Warren, (1) capital of Trumbull county, Ohio, 52 miles by rail SE. of Cleveland, with steel mills, and manufactories of machinery, metal-ware, carriages, &c., is the centre of a rich agricultural district; pop. (1920) 27,050.—(2) Capital of Warren county, Pennsylvania, on the Alleghany River, 66 miles by rail SE. of Erie, manufactures furniture and chemicals, has flour, silk, and woollen mills, and also oil-refineries; pop. (1920) 14,272.

Warren, SIR CHARLES (1840–1927), general and archæologist, played a conspicuous part during the last quarter of the 19th century as a commander of British forces in South Africa, and served also elsewhere. He is, however, chiefly remembered for his work in connection with the archæological exploration of Palestine, especially Jerusalem, and for his writings arising therefrom: *Underground Jerusalem* (1876), *Temple and Tomb* (1880), *Jerusalem* (with Conder, 1884). He wrote on ancient weights and measures (1903 and 1914).

Warren, SAMUEL, novelist, was born in Denbighshire, 23d May 1807. He studied medicine at Edinburgh and law at the Inner Temple, and was called to the bar in 1837. He was made a Queen's Counsel (1851), was Recorder of Hull (1854–74), represented Midhurst in the Conservative interest (1856–59), and then he was appointed one of the two Masters of Lunacy. His *Passages from the Diary of a Late Physician* (1832) had been contributed to *Blackwood's Magazine*, as also was *Ten Thousand a Year* (1841), the amusing story of 'Tittlebat Titmouse.' By these he is chiefly remembered; but he published a dozen more works, including *Now and Then* (1847), *The Lily and the Bee* (1851), and several law-books. He died in London, 29th July 1877.

Warrington, a municipal, county, and parliamentary borough and manufacturing town of Lancashire, on the right bank of the Mersey, 18 miles E. of Liverpool, 16 WSW. of Manchester, and 182 NW. of London. Though of recent development, it is an ancient place, the *Wallintun* of Domesday; and, acquiring strategic importance through its bridge (1496) over the Mersey, it was the scene of defeats of the Scots (1648), the royalists (1651), and a portion of Prince Charles Edward's forces (1745). To a dissenting academy (1757–83), it owes its memories of Drs Aikin, Priestley, Taylor, &c.; Mrs Barbauld was associated with Warrington; and Lucy Aikin was a native. There are still some old timbered houses; and the parish church, St Elphin's, with a spire 300 feet high, is a fine cruciform Decorated structure, restored in 1859–67. The town-hall was the seat (1750) of Col. Wilson Patten, purchased in 1872; and other buildings are the Royal Court Theatre (1907), post-office (1907), hospital (1876), museum and library (1857), school of art (1882), public baths (1866 and 1913), grammar-school (1526; rebuilt 1857), Parr Hall (1895), county court-house (1897). The town has numerous parks and recreation grounds. The manufactures include iron, wire, pins, files, cottons, glass, leather, and soap. Warrington was constituted a parliamentary borough, returning one member, in 1832, and a municipal borough in 1847. Pop. (1851) 22,894; (1891) 55,349; (1921) 76,811.

See a monograph on the worthies of Warrington by James Kendrick (1853), and others by William Beamont (Chetham Society, 1872–73) on an Augustinian friary founded in 1379, on the lords of Warrington, &c.

Warriston. See JOHNSTON (ARCHIBALD).

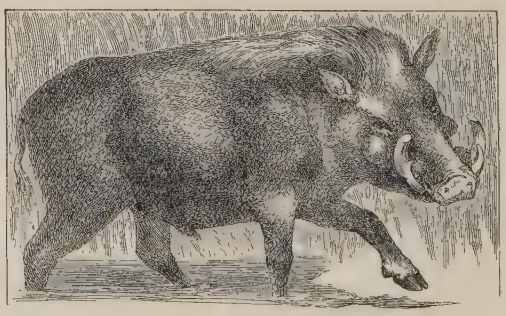
Warsaw (Polish *Warszawa*), the capital of Poland, stands on the left bank of the Vistula, 330 miles E. of Berlin by rail and 700 SW. of St Petersburg. It stands partly on a high plain, partly on the terraces sloping upwards from the left bank of the river, extends over a wide area, and consists of the city proper and a number of suburbs. Three bridges connect Warsaw with the suburb of Praga, on the right bank of the Vistula. Standing on a navigable river, with great railway lines to Moscow, St Petersburg, Vienna, Danzig, and Berlin, Warsaw is one of the most important towns in eastern Europe. It is surrounded by walls with eleven gateways, beyond which lie the suburbs. The old town consists mostly of slums and is given over to the Jews, but the new town has handsome boulevards, spacious squares and gardens. The former royal castle in Sigismund Square is an imposing building, and contains many pictures and sculptures, while there are innumerable palaces, the finest of which are the Krasinski, Belvedere, and Lazienki; the last has beautiful gardens containing an open-air theatre. After the World War, many Polish art treasures were honourably sent back from Russia, and collections such as the Museum of Arms (1921) came to be formed. There are very many churches; the majority are Roman Catholic, including the cathedral of St John (founded 13th century and restored 17th century) with interesting wall monuments, and the church of St Anne (1454); the Lutheran church (1799) is notable, while the Orthodox Alexander-Nevski cathedral (1894–1912) erected in the Saxon Square, was pulled down by the Poles after the World War. Warsaw is the seat of a Roman Catholic and of an Orthodox archbishop, and in 1924 an Exarchate of the Orthodox Church was established here. There are numerous public monuments. The State University, founded 1816, closed by the Russians 1831-62 and 1869–70, and refounded as a Polish university in 1915, has a fine library. Other educational institutions are the Free University (1905), the Polytechnic, and numerous academies of commerce, agriculture, music, &c. Warsaw is an important industrial centre, the principal manufactures being those of metal wares, machinery, chemicals, hosiery, boots and shoes, tobacco, sugar; and there is a trade in corn and coal. Pop. (1860) 161,000; (1880) 383,000; (1897) 683,692; (1921) 936,713.

Warsaw came into prominence as the residence of the Dukes of Mazovia, and became the capital of Poland only in 1550. Thenceforward the history of the town is really that of Poland (q.v.) itself. During the 17th century, Warsaw was the scene of much fighting; in 1702 it was taken by the Swedes, in 1794 by the Russians. It was in possession of Prussia 1795–1806, and was the capital of the duchy of Warsaw 1806–13, when it was seized by the Russians. Insurrection with rioting and bloodshed took place in 1830–31, 1862–63, 1905–6. The Germans occupied the town in 1915–18. See POLAND (*History*), RUSSIA (*History*).

Wartburg. See EISENACH.

Warthe, the Oder's chief affluent, rises in the south-west of Poland, flows north and west, then north (past Posen), and west again into Prussia, and enters the Oder at Küstrin. Length, 445 miles.

Wart-hog (*Phacochœrus*), a genus of Suidæ, closely resembling the true hogs in most of their characters, and particularly in their feet, but remarkably differing from them in their dentition: the number of teeth is much reduced; the canines become the large tusks, and in the adult the last molar only is found in each jaw, which grows to an enormous size as in the elephant. The head is very large, and the muzzle very broad; the cheeks are furnished with large wart-like excrescences, so that the appearance is altogether very remarkable and uncouth. The species are all natives of Africa. They feed very much on the roots of plants, which they dig up by means of their enormous tusks. The African Wart-hog, or Haruja (*P. æliani*), a native of Abyssinia and of the central regions of Africa, from the coast of Guinea to that of Mozambique, is nearly 4 feet long, with a naked slender tail of 1 foot, is scantily covered with long bristles of a light-brown colour, and has a mane sometimes 10 inches long, extending from between the ears



Wart-hog (*Phacochœrus æthiopicus*).

along the neck and back. Another species is found in the south of Africa (*P. æthiopicus*), the *Valke Vark* of the Dutch colonists at the Cape of Good Hope. The incisors of the latter fall out at an early age, those of the former are persistent. A closely allied genus is Potamochœrus, of which there are several species, as the *Bosch Vark* of the Cape (*P. africanus*), which is nearly black, with whitish cheeks having a central black spot, and the Painted Pig of West Africa (*P. penicillatus*),

which is reddish, with black face, forehead, and ears; another and less known species is *P. edwardsi* from Madagascar. The species of Potamochœrus frequent swampy grounds, and sometimes receive the name of Water-hog. They have longer ears than the true wart-hogs, tapering and ending in a pencil of hairs; the face is elongated, and has a huge protuberance on each side. The flesh of all the wart-hogs and water-hogs is in high esteem. They are hunted by dogs, which are often killed in the encounter with them. They are much addicted to fighting among themselves. This genus hardly differs from Sus, except in general appearance and colour. Even the protuberance on each side of the face is slightly marked in *S. verrucosus*.

Warton, Joseph, was born at Dunsfold, Surrey, in 1722, son of the Rev. Thomas Warton (1688–1745), vicar of Basingstoke in Hampshire, and sometime professor of Poetry at Oxford. At fourteen he was sent to Winchester, whence in 1740 he passed to Oriel College, Oxford. In 1748 he was presented to the rectory of Winslade near Basingstoke, was appointed second master of Winchester in 1755, and was its head-master from 1766 till his retirement in 1793. His preferments were a prebend of St Paul's, the living of Thorley, Hertfordshire, a prebend of Winchester, and the rectory of Easton, which he soon after exchanged for that of Upham. His *Odes* (1746) marked a reaction against the dominant school of Pope. An edition of Virgil (1753), with translation of the *Eclogues* and *Georgics*, gained him a high reputation. He was much esteemed by Dr Johnson, and, like his brother Thomas, was one of the members of the famous Literary Club. In 1756 appeared the first volume of his *Essay on the Writings and Genius of Pope*, the second and concluding volume following only in 1782. The distinction it drew between the poetry of reason and the poetry of fancy marked an important point in English criticism. His latest works were an annotated edition of Pope (9 vols. 1797) and a similar edition of Dryden, of which he had published two volumes at his death, in London, 23d February 1800. See the *Memoir* by the Rev. John Wooll, a ridiculously stilted panegyric (1806).—Thomas Warton, his brother, was born in 1728 at his father's vicarage of Basingstoke. In 1743 he was entered at Trinity College, Oxford, where he obtained a fellowship in 1751. He remained at the university as a tutor, and in 1757 was appointed professor of Poetry. In 1767 he took his B.D. degree, and was soon after presented to the living of Kiddington, to which he added in 1782 the college living of Hill Farrance in Somersetshire. But he had more taste for the pipe and tankard than clerical duty, and we are told how he mostly confined himself in preaching to two sermons—one his father's, the other a printed one, and even that abridged. His *Observations on the Faerie Queene of Spenszr* (1754; 2d ed. expanded to 2 vols. 1762) established his reputation as a critic. But the work by which Thomas Warton will be ever remembered is his *History of English Poetry* (1774–78–81; ed. in 4 vols. by W. C. Hazlitt, 1871), which, in the width of its learning, remains to this day unrivalled. As a poet Warton takes distinct if hardly high rank. In 1777 he published a collection, and on the death of Whitehead, the poet-laureate, he had the honour, such as it was, of succeeding him in the office. That same year he was elected Camden professor of History at Oxford. His last work was an elaborately annotated edition of the Minor Poems of Milton (1785). He died suddenly, 21st May 1790. His miscellaneous writings included humorous and burlesque poetry and prose, genial satires on Oxford, an edition of Theocritus, lives of Thomas Pope and Bathurst, two Trinity College benefactors, *Inquiry into the authenticity of the Rowley Poems*, &c. See the Life in Mant's edition of his poems (1802); Dennis, *Studies in English Literature* (1876); and studies by W. P. Ker (1910), and Rinaker (1916).

Warts (sometimes known in Surgery by their Latin name *Verrucæ*) are collections of lengthened papillæ of the Skin (q.v.), closely adherent and ensheathed by a thick covering of hard dry cuticle. From friction and exposure to the air their surface presents a horny texture, and is rounded off into a small button-like shape. Such is the description of the simple wart, which is so commonly seen on the hands and fingers (and rarely on the face or elsewhere) of persons of all ages, but especially of children. Amongst other varieties of warts are (1) one to which the term *Verruca digitata* has been applied. It is more elongated in shape, and less protected by cuticle than the preceding. It is said to occur nowhere but on the scalp of women of adult age, and sometimes to occasion great annoyance in brushing and combing the hair. (2) *Subungual warts*, growing, as their specific name implies, beneath or at the side of the finger or toe nails. They originate beneath the nail, and as they increase they crop out either at the free extremity or the side of the nail, and are usually troublesome, and often very painful. They are often of syphilitic origin. (3) *Venereal warts*, caused by the direct irritation of the discharges of gonorrhœa or syphilis, and occurring about the parts which are liable to be polluted with such discharges. They attain a larger size, and are more fleshy and vascular than other warts.

Nothing is known of the causes of warts further than that the third variety is induced by an irritating discharge, that the malignant form of wart which is the beginning of chimney-sweepers' cancer is caused by the irritation of soot, and that persons engaged in dissection and *post-mortem* researches are especially liable to them; hence we may infer that they are always due to some local irritation. Venereal warts are certainly contagious; with regard to others, we cannot speak positively. According to popular belief, blood from a wart is capable of producing similar warts when applied to the skin, and occasionally, but rarely, this has been the case in the experience of surgeons. In consequence of the capricious way in which warts often undergo spontaneous cure, there are numerous popular charms for their removal, several of which may be found recorded in the pages of *Notes and Queries*. Common warts are so apt to disappear that they may be often left to themselves. If it is desired to remove them, glacial acetic acid or nitric acid may be applied with a glass rod till the wart is well sodden, care being taken not to blister the neighbouring skin. One or at most two applications are usually sufficient. Nitrate of silver and tincture of iron are popular and general applications. Salicylic acid in collodion (see Corns) is also very effective. Small warts hanging by a neck may often be very simply removed by the tight application of an elastic ligature (e.g. a small broken elastic ring) to the base. The wart usually shrivels up and falls off within a week. The other varieties of warts must be left to the surgeon.

Warwick, the county town of Warwickshire, on the Avon, 21 miles SE. of Birmingham, 107 NW. of London. Chartered as a municipal borough by Henry VIII., it has, in spite of a great fire in 1694 (with estimated damage of £90,000), quite preserved its mediæval appearance, with a good deal of the domestic architecture, and still possesses two of its old gates with chapels built above their archways. Warwick's chief glory is the stately castle, built on a rocky elevation 40 feet high,

overhanging the Avon. Ethelfleda, King Alfred's daughter, built a fortress here about 915; but the present castle, which extends over 3 acres, is all of post-Conquest erection, its oldest portion being the huge Cæsar's Tower (147 feet high), whilst Guy's Tower (128 feet) was built in 1394. Having passed ere then, with the earldom of Warwick, to the Beauchamps, Nevilles, Plantagenets, Dudleys, and Riches, it had long been ruinous when in 1605 it was granted to Sir Fulke Greville, the first Lord Brooke (q.v.), whose descendant, Francis Greville, was in 1759 created Earl of Warwick, and who spent at least £20,000 in repairing and beautifying it. It stood a memorable siege by the royalists during the Great Rebellion in 1642, and its great hall and most of the eastern wing was gutted by fire in 1871, but by 1876 the damage had been repaired, and Warwick Castle is now one of the few feudal residences still tenanted. Besides relics of Guy of Warwick (q.v.), the 'King-maker,' and Cromwell, it has paintings by Van Dyck, Rubens (including his famous painting of Ignatius Loyola, founder of the Jesuit Order), Lely, Holbein, and other masters, the 'Grimani table' (from the Grimani Palace at Venice), and the Greek 'Warwick Vase,' 7 feet in diameter, from Hadrian's villa at Tivoli. It has welcomed many royal visitors, as Queen Elizabeth, James I., William III., and Queen Victoria. St Mary's Church is a large cruciform perpendicular structure, partly rebuilt after the great fire, with a Norman crypt and a wealth of interesting monuments, including the superb Beauchamp Chapel, begun in 1443 and consecrated in 1475. The Leycester Hospital, considered to be one of the finest examples of half-timbered houses in England, was founded in 1571 by Robert Dudley, Earl of Leicester, the favourite of Queen Elizabeth. Originally used as the hall of the United Guilds (of the Holy Trinity and St George) it passed from them after the dissolution to the corporation, by whom it was granted to Dudley for a hospital, and is now the residence of a master and twelve poor brethren. The King's Grammar School, originally founded in 1123, and refounded as 'The King's Newe Scole of Warwyke' in 1546, occupies comparatively modern buildings overlooking the Avon. The industries include furniture, gelatine, and agricultural implements, and there is a considerable trade in agricultural produce. Race meetings are held on St Mary's Common. Walter Savage Landor was born here. Originally returning two members, it now forms part of the Warwick and Leamington parliamentary division. Pop. (1901) 11,889; (1911) 11,858; (1921) 12,863.

See Countess of Warwick's *Warwick Castle and its Earls* (2 vols., 1903) and Leach's *History of Warwick School . . . and Borough of Warwick* (1906), Field's *Town and Castle of Warwick* (1815), Thomas Kemp's *The Black Book of Warwick* (1898), and his *History of Warwick and its People* (1905).

Warwick, Richard Neville, Earl of, the King-maker, eldest son of Richard, Earl of Salisbury and Alice Montacute, was born November 22, 1428. The house of Neville had been built up by a series of wealthy marriages, and Richard was no exception to the rule. While yet a boy he was married to Anne, daughter of the Earl of Warwick, and through her, after the death of her brother and niece, he took his place at the age of twenty-one among the chief earls of the realm. By this time the English rule in France had broken down, bringing the reigning house of Lancaster into great unpopularity, and throwing a correspondingly greater influence into the hands of the leader of the opposition, the Duke of York. He was brother-in-law to the Earl of Salisbury, and so attached to his party the powerful influence of the Nevilles. The Duke of York at first made no claim to the throne, demanding only that he should have his place in the councils of the king, and even when swords were drawn the Yorkists swore their allegiance to the king while fighting against his advisers. The Wars of the Roses (q.v.) began with the battle of St Albans (1455), which was gained to the Yorkists chiefly by the help of Warwick. By a sudden sally into the streets of the town he routed the royal forces, and gained for himself that character of daring and courage which he maintained to the end. He was rewarded with the post of captain of Calais, which he retained throughout the changes of the parties. In this position he was practically independent, and scoured the Channel at his pleasure. In 1458 he attacked some vessels which were under a treaty of peace with England, and being summoned to London to answer before the king, was violently attacked by the followers of Somerset and barely escaped with his life. In 1459 the civil war finally broke out. In the first campaign the Yorkists failed owing to their inactivity. The leaders fled to the coast of Devon, where they hired five men to carry them to Bristol. As soon as they left land, Warwick stripped to the doublet and took the helm, and steered straight for Calais, where he arrived in a few days. And when Somerset came to claim the keys of the stronghold, he had the mortification to find Warwick there before him.

Warwick was next in England on June 27, 1460, when he landed at Sandwich. In four days he was before the walls of London, having marched in that time a distance of 70 miles. In the beginning of July the battle of Northampton was fought. The Yorkists gained a complete victory, and took Henry prisoner. Before the fight Warwick issued the command to spare the common people but to slay the nobles, judging the quarrel to be more especially theirs, and it is significant that throughout the Wars of the Roses the proportion of leaders slain far exceeds that in any other war. Up to this time Warwick's conception of the war was merely the natural struggle of the one party with the other for power, using as their means the rude arguments of the time. He still maintained his loyalty to King Henry, and when the Duke of York after the battle of Northampton presented his claim to the throne Warwick opposed him, and prevailed upon him to waive it till the death of the king. But naturally such a state of things could not long endure. Warwick, while respecting the person of the king, was fighting against his orders, and so, while professing loyalty, was actually a rebel. Soon the struggle blazed out anew, and in December 1460 the Duke of York was defeated and slain at Wakefield. Early in 1461 Warwick was defeated in the second battle of St Albans, but the royalists not taking advantage of their victory, Edward, son of the Duke of York, accompanied by Warwick, marched on London, and was proclaimed king as Edward IV. Soon after the Yorkists gained a complete victory at Towton (1461), the bloodiest field of the whole war. Nearly all the Lancastrian chiefs were slain, Henry's cause was lost, and ere long he was captured by Warwick and lodged in the Tower. The credit of the crowning victory of Towton does not rest with Warwick alone, for he had the help of young Edward, a greater military genius than himself. Little is known of the details of the fighting, but we are told that wherever the Earl of Warwick was there the fight raged hottest. But now, when Warwick might have expected to reap the reward of his labours, new troubles arose. King Edward began to feel jealous of his power, his unique influence, and vast popularity. Warwick was sent to France to arrange a treaty

with Louis, and to propose a marriage between Edward and his wife's sister. On his return he found the king married to Elizabeth Woodville, daughter of Lord Rivers, and an alliance made with the enemy of Louis, the Duke of Burgundy. Edward now lavished all his kindness on the Woodvilles, intending to use them as a counterfoil to the Nevilles, and for this purpose he deprived the Nevilles of some of their posts. By a series of deliberate insults Warwick was driven further and further away from the king, till he was forced into open revolt. Louis XI. used his influence in bringing Warwick and Margaret together, and they agreed to forget their differences in the face of a common enemy. Clarence, the king's brother, joined their party and married Warwick's daughter. Edward fled to Holland, and the king-maker placed Henry once more upon the throne. But ere long Edward secretly landed in England, raised an army not without difficulty, and met Warwick at Barnet. The faithless Clarence had in the meantime deserted Warwick and joined his brother's army. The army of Warwick was composed of strangely different elements—old enemies fighting side by side as friends. The battle was lost mainly through a grievous blunder. In the heavy mist which hung around the party of the Earl of Oxford was mistaken for the enemy and was attacked by their own friends. The cry of treachery was raised, and the whole army broke into utter rout. Warwick resisted till all hope was gone. He had fought on foot throughout the battle, and his heavy armour did not suffer him to escape. He was surrounded and slain, fighting manfully, April 14, 1471.

Thus fell on the field of battle Richard, Earl of Warwick, in the prime of his life, after sixteen years of deep intrigue and desperate fighting. Had he been born in a more peaceful time he would have been a great statesman, and have done much for the good of his country, for his talents were more political than military, and almost alone amongst the self-seeking rivals of the time he shows something of the instincts of patriotism. Cast as he was in the troublous times of the Wars of the Roses, he stands out in character and genius above all those of his generation. He was the best beloved man in the kingdom. When he was away from England, says Hall, the common people thought the sun had gone out of the heavens. His personality cast a charm over even Louis XI. The heart of the Yorkist party, he was true to its cause till he found that his service was no longer desired. He was not the man to sit quietly under insult, and when it came from King Edward, who owed all that he was to him, it was more than he could endure. Yet it was only when he found his every project thwarted, and especially those that were dearest to his heart, that he was driven into open warfare with the king. His treason is capable of much justification: he cannot be accused of forsaking his master. He had in him the making of a great king, and how great and useful might have been his career had fortune placed him over the councils of a Charles VII. or a Henry VI.! As it is, he stands in worth and character far above any of his time, a figure that commands not merely admiration but affection.

Lytton's *Last of the Barons* is but poor stuff as romance, and is not to be taken seriously as history. See Polydore Virgil, Waurin, and Hall; and of modern books, J. Gairdner, *The Houses of Lancaster and York* in 'Epochs of History' (1874), C. W. Oman's study in 'English Men of Action' (1891), and Sir James Ramsay's *Houses of Lancaster and York* (1892); also PERCY.

Warwickshire, a west midland county of England, bounded by the counties of Stafford, Leicester, Northampton, Oxford, Gloucester, and Worcester, is well served with railways and canals. It has an extreme length from north to south of 52 miles, an extreme breadth of 33 miles, and an area of 557,527 acres (or, including associated county boroughs, 605,275 acres). In the south are spurs of the Coteswolds, as the Edge Hills (826 feet); but elsewhere the surface is varied only by gentle undulations, mainly, in former times, covered by the forest of Arden. The Avon, flowing from north-east to south-west towards the Severn, is the principal river; but in the north is the Tame, a tributary of the Trent. New Red Sandstone is the chief formation, with Lias to the south; and a coalfield, 16 miles by 3, extends from near Coventry to the Staffordshire boundary east of Tamworth. The output of coal in 1921 was 3,434,422 tons, of a total value of £4,566,107; Warwickshire also produces some fireclay, ironstone, limestone, &c. About seven-eighths of the total area is in crops and permanent pasture; woods and plantations occupy nearly 21,000 acres. The great industries are noticed under Birmingham, Coventry, and Rugby; other towns are Warwick (county town), Leamington, Stratford-upon-Avon, Nuneaton, and Sutton Coldfield. The county, which comprises four hundreds and 260 civil parishes, is in the midland circuit and the diocese of Coventry (archdeaconries of Coventry and Warwick). For parliamentary purposes it is divided into four divisions, each returning one member—the north or Tamworth, north-east or Nuneaton, south-west or Warwick and Leamington, and south-east or Rugby. The county councillors number 72. The antiquities include a megalithic group known as the 'Rollright Stones,' which, however, is chiefly in Oxfordshire, several Anglo-Saxon remains, Pre-Norman earthworks, Roman stations (the three Roman roads, Watling Street, The Fosse Way, and Ryknield Street run through the county), a wealth of mediæval remains, as Warwick, Kenilworth, and Maxtoke castles, and the remains of the Cistercian abbeys of Merevale, Stoneleigh, and Combe. The battlefield of Edgehill must also be noticed; whilst of Warwickshire worthies may be mentioned Shakespeare, Baskerville, Samuel Butler, David Cox, Drayton, Dugdale, 'George Eliot,' Landor, Dr Parr, and Priestley. Pop. (1901) 897,678; (1911) 1,247,418; (1921) 1,390,092.

See Dugdale's *Antiquities of Warwickshire* (1656; new ed. by W. Thomas, 2 vols. 1730), and later histories by W. Smith (1830), West (1830), Timmins (1889), Burgess (1893), the 'Victoria History' (1905–7), *Memorials of Old Warwickshire*, edited by Alice Dryden (1908), and *Unknown Warwickshire*, by Mary Dormer Harris (1924).

Wash, a wide estuary on the east coast of England, between the counties of Lincoln and Norfolk, is 22 miles in length and 15 in average breadth. It is surrounded by low and marshy shores, and receives the rivers Witham, Welland, Ouse, Nen, and Nar. The estuary for the most part is occupied by sandbanks, dry at low-water, and between these sandbanks are the channels through which those rivers flow into the North Sea. On both sides of the channel by which the Ouse falls into the sea considerable tracts of land have been reclaimed. Anchorage is afforded to vessels by two wide spaces or pools of water, called respectively Lynn Deeps, opposite the Norfolk, and Boston Deeps, off the Lincoln coast.

Washing-machines. There are many kinds of domestic washing-machines. One of the simplest is the dolly, a wooden disk with three or more projecting arms placed on an upright shaft in a tub. The arms are moved round backwards and forwards amongst the clothes. Nearly all domestic washing-machines consist of a tub or cistern of a form which suits the nature of the moving parts of the apparatus. Some operate by squeezing the

clothes between grooved rollers, others by rubbing them between corrugated surfaces by a rocking or up and down motion, others again have a combined squeezing and rubbing action. The general idea is that the water having some detergent or cleanser in solution is caused to pass over and through the fabrics under treatment. This may be done mechanically as above mentioned, or by means of an appliance consisting of an outer vessel like a large pail into which loosely fits a funnel-shaped vessel with perforations round its outer edge placed in an inverted position upon the bottom of the pail. When set upon a stove the heated water rises through the central tube, and is deflected downwards through the fabrics with which the vessel is filled, thus ensuring a constant circulation.

Machines driven by power consist of a strong horizontal cylindrical outer casing with the necessary provision for charging with hot water and steam, and for discharging them, inside which rotates to and fro a perforated brass drum containing the clothes to be washed. V-shaped bars or beaters projecting from the inner surface of the drum lift the clothes about so that they continually fall through the water, which only partially fills the drums, giving the necessary circulation of the cleansing medium. Less depth of water is used when cleansing than when rinsing, and the cleansing waters are changed without removing the garments from the machine. The direction of rotation is reversed after about three revolutions, and a 28-inch drum 48 inches long will deal with 120 shirts or the equivalent at each charge, although larger machines are made. For silks and flannels a machine is used consisting of an open vessel, over the centre of which is a vertical spindle, carrying at its end three or more arms carrying perforated cones, the open mouths of which press the fabrics under water as the spindle rises and falls under the action of an eccentric. The vertical spindle rotates slightly at each rise, so that all the fabric comes under the action of the 'possers.' This method gives less wear and tear upon delicate articles. Improved forms of large washing and scouring machines used in factories are illustrated in recent volumes of *The Laundry Record*. See also the article BLEACHING.

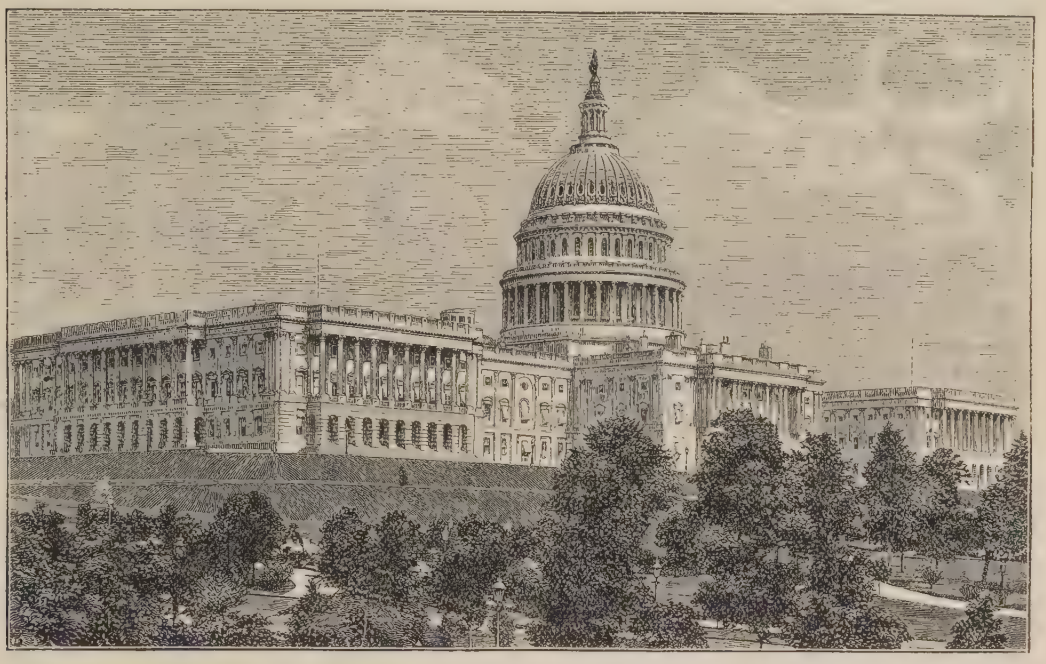
Washington, the most north-westerly state of the American Union, popularly known as the 'Evergreen State,' lies south of British Columbia, is bounded by Idaho on the E., Oregon on the S., and borders upon the Pacific Ocean on the W. From east to west it measures about 330 miles, and its width from north to south is about 220 miles. Its area is 69,127 sq. m., of which the water-surface occupies 2291 sq. m. It ranks nineteenth in area and thirtieth in population of all the states and territories.

The Cascade Range (q.v.) traverses the state from north to south, forming a natural topographical division. For convenience the region between the Cascades and the Columbia River is described as Central Washington, and the portion east of the river as Eastern Washington. The summits of several of the volcanic cones are covered with perpetual snow, and the glaciers which fill their upper slopes rival in beauty the Alpine ice-rivers of Switzerland. Western Washington, which comprises about one-third of the state, is a mountainous region interspersed with numerous fertile valleys. The Coast Range to the west of the Cascades extends in broken and disorderly masses from the southern border of the state along the Pacific coast to Cape Flattery at the entrance to the Strait of Juan de Fuca. The mountains of this range increase in height toward the north, where they are known as the Olympic Mountains. Mount Olympus, the loftiest summit, is 8150 feet high. The coast is abrupt, except at Shoalwater Bay and Gray's Harbour, and many short and rapid streams flow down the western slopes directly into the ocean. The tide-water basin at the mouth of the Columbia River and the Chehalis valley, farther north, are the most important indentations of the coast south of the Strait of Juan de Fuca. This body of water, together with the extensive inland sea known as Puget Sound, affords some of the best harbours in the world, and is of enormous commercial importance. Puget Sound has a coast-line of more than 1500 miles, and receives the waters of numerous rivers. Central Washington is a lofty plateau region, its surface, like that of Eastern Washington, largely covered with lava and other volcanic products. It is traversed by spurs of the Cascade Mountains, and exhibits many abrupt changes of elevation. The Yakima River and other tributaries of the Columbia have carved deep valleys in the plateau. The streams are broken by falls and rapids, presenting a succession of varied and picturesque scenery. East of the Columbia the plateaus and plains are cut by the valleys of Clark's Fork and the Spokane and Snake rivers. In the north-east the surface is diversified by spurs of the Pend d'Oreille Mountains, and in the south-east the highest elevations belong to the Blue Mountains, which extend into the state from Oregon. The whole of the eastern part of the state and a portion of the region west of the Cascades are drained by the Columbia River, which for a distance of nearly 300 miles forms the boundary between this state and Oregon. In Western Washington, especially in the vicinity of Puget Sound, the winters are very mild. The rainfall is heavier than in any other portion of the United States. East of the Cascades the winters are colder and the rainfall lighter, and in some parts irrigation is necessary. The warm ocean current which bathes its western shores gives, however, to the whole state a climate much milder than that prevailing in sections to the east which have the same latitude. Lumbering is one of the leading pursuits. Western Washington is heavily wooded with red cedar and pine. Many of the trees are of enormous size, and in the density of their growth some of the forests are scarcely surpassed by those of the tropics. The soil is exceedingly fertile in many sections of the state. Portions of Central and Eastern Washington are very well adapted for wheat and vegetable growing, and for the raising of live-stock, while vast quantities of fruit are grown all over the state. There are extensive coalfields around Puget Sound, and coal-mining is an important industry. There are also copper, gold, and silver mines, and cement is manufactured. The industries are connected mostly with the natural products of the state; the manufacture of lumber and shingles and ship-building are especially important. The fisheries along the coast, and the salmon-canneries on the Columbia River, are of considerable value. The potential water-power of the state is very great.

Washington was first organised as a territory in 1853, with an area much greater than that of the present state. It was reduced to its present limits in 1863, and was admitted to the Union as a state in 1889. The state has thirty-nine counties. Olympia (8000), the capital, is situated at the head of Puget Sound. Seattle (315,312), near which is found the University of Washington, Tacoma (96,965), both on Puget Sound, and Spokane (104,437), on the Spokane River, are the largest towns. Bellingham and Everett, also on Puget Sound, are important. The state sends to congress 2 senators and 5 representatives. Pop. (1880) 75,116; (1900) 518,103; (1910) 1,141,990; (1920) 1,356,621. See *History* by Meany (1909).

Washington is the name of a large number of towns, townships, villages, and hamlets in the United States, of which the largest, after the federal capital, is the capital of Washington county, Pennsylvania. It has flour-mills, machine-shops, and various manufactures, and is in an oil-producing district. Pop. (1920) 21,480.

Washington, capital of the United States, is situated in, and since 1871 co-extensive with, the District of Columbia (q.v.), on the Potomac River, in 38° 51′ lat., 77° long.; and is distant 228 miles S. from New York, 136 from Philadelphia, and 40 from Baltimore. The city proper, the so-called 'City of Magnificent Distances' covers an area of about 10 sq. m., or, with Georgetown (now West Washington), the country portion of the District, and about 9 sq. miles of water area, 69¼ sq. m. altogether. The original plan of the city proper was made in 1791 by L'Enfant, a French engineer who had adopted America as his residence. Characteristic features are the crossing of the rectangular streets by frequent broad transverse avenues, 120 to 160 feet wide, and the numerous circles and triangular reservations interspersed as little parks throughout the city. With marvellous foresight of the future greatness of the country, plans were laid out on a scale so ample, with such wide spaces between the public buildings, as to lead to much early ridicule. More than half the area of the city is occupied with parks, avenues, and streets, the two latter chiefly paved with asphalt and thickly planted with shade-



The Capitol, Washington.

trees of many varieties, so that splendid vistas are obtained. Besides the small open spaces, Washington has the Rock Creek Park of some 1600 acres, extending on the NW. for miles along the picturesque banks of a stream, amid forests of great natural beauty; the Potomac Park (740 acres) on the SE., connecting with the Capitol by the Washington Park (41 acres), the Agricultural, Smithsonian, Armoury, and Public Grounds, and the Botanical Gardens, this stretch being known as the Mall; the grounds of the Soldiers' Home (600 acres to the N.), an improved park and forest, which serve also as a free driving-park and attractive rural resort; the National Zoological Park (175 acres), administered by the Smithsonian Institution. Floriculture is carried on in the county portion of the District.

The architecture of the city in the older settled districts is cheap and commonplace, but in the newer Washington it is of striking variety and attractiveness. The government buildings are mostly fine and imposing structures. The Capitol, in which the national congress meets and the supreme court holds its sittings, is conspicuously placed on an eminence, commanding a noble view, and stands in its own grounds. The central building was built (1793–1825) from the modified plans of Dr William Thornton, while the two wings were added later (1850–59). The central rotunda, of white painted sandstone, with its lofty iron dome crowned by a bronze figure of Liberty (1863), is 285 feet in height, and contains elaborate frescoes and historical paintings by Trumbull (q.v.), Brumidi, and others. The wings, of white marble, contain respectively the hall of the House of Representatives (435 members) and the Senate Chamber (96 senators). The National Memorial Hall in the Capitol is to receive statues contributed by each state to commemorate two of its distinguished citizens, while the length of the whole building is 751 feet. The president's house and executive mansion, also in its own grounds, built 1792–99 after plans by Hoban and extended in 1902, is a plain edifice of sandstone painted white (whence called the 'White House'), an adaptation of Italian Renaissance style. The Pennsylvanian Avenue connects the Capitol with the White House about a mile and a half distant, but also stretches right through the city. On opposite sides of the White House are placed the Treasury Building, built of freestone and granite in the Ionic style 1836–41 and extended 1855–69, and the State, War, and Navy Building (1871–93), of granite in Roman Doric style (though the Navy

Department has since been moved elsewhere). The Library of Congress was first established in 1800, but was severely damaged by fire in 1814, 1825, and 1851. The present building, of white granite in Italian Renaissance style, situated just E. of the Capitol, dates from 1886–97, and contains about three million printed books and pamphlets and two million other items, manuscripts, documents, incunabula, music, prints, &c., besides many splendid sculptures, mosaics, and mural decorations. The Corcoran Art Gallery, finished in 1897 in Neo-Grecian style, built of white marble on the basement and pink granite on the upper stories, contains many sculpture casts and a large collection of American paintings. The Smithsonian Institution (q.v.) has a spacious administrative building, and has control over the important United States Natural History Museum and the National Art Gallery. The Freer Art Gallery (1902) is notable for its magnificent collection of the work of Whistler. The Pan-American Union Building (1908–10) has much attractive ornamentation, and a patio or open central court, while the United States Academy of Sciences Building (1919–24) has a simple classical design with rich sculptural and mural decorations. Other important buildings include the Patent Office, the Government Printing-office, the Post-office; the buildings of the old General Land Office, of the Department of the Interior, of the Agricultural Department, of the National Geographical Society, of the American Red Cross; the Union Railway Station, the Carnegie Institute (for scientific research), and the Carnegie Free Library, the Chamber of Commerce, and the Victory Memorial. Many of the structures are of white marble, and most of them date from the 20th century. Washington is characterised by the absence of 'skyscrapers,' and by the possession of many fine historic private mansions, especially round Lafayette Square.

There are a large number of churches of all denominations. Washington Cathedral (Protestant Episcopal) is being erected on Mount St Alban, a great building in 14th century Gothic style, 534 feet in length. Already it contains the tombs of a number of distinguished Americans—President Wilson and Admiral Dewey among them. Of other churches, St John's Protestant Episcopal and the Church of the New Jerusalem are the most notable. Of statues erected in honour of famous men, presidents, statesmen, soldiers, &c., Washington has an abundance, and hardly a public square or circle is without its monument. That to George Washington (1848–85), in the Washington Park to the W. of the capitol, is an obelisk of white marble 555 feet in height, which can be ascended. The Lincoln Memorial (1911–22), in the Potomac Park, consists of a spacious hall, inside which is a colossal seated figure of Lincoln, 30 feet in height from the base; the hall rests on a series of huge stone terraces. Washington is rich in institutions of learning, and its numerous public museums, libraries, and art galleries afford invaluable aids to those pursuing academical or professional studies. There are five universities situated in the District. Georgetown University (1789), managed by the Jesuits, is partly in Georgetown. The George Washington University (1821), endowed later by W. W. Corcoran, and up till 1904 called the Columbian University, is non-sectarian. The Howard University (1867) is almost entirely concerned with coloured people. The Catholic University of America is situated in the NE. of the city in 144 acres of grounds. The American Methodist University is much smaller. There are a large number of efficient public high and normal schools, schools of languages, business colleges, &c., while the Smithsonian Institution (q.v.), founded in 1846, affords valuable advantages to all institutions of learning, in the United States and abroad, through its system of international exchanges and by its numerous publications of the fruits of original research in many departments of science. Washington, too, is the seat of many learned bodies, while the Carnegie Endowment for Peace was established here in 1910. The Deaf and Dumb Institution and the Asylum for the Insane are restricted to residents of the District of Columbia and to those connected with the army or navy. There are numerous hospitals, homes, and charitable institutions, while the National Soldiers' Home (1851) is in the midst of fine grounds. There is also a Naval Observatory and a Navy Yard at Washington, while the city is abundantly supplied with pure water by a conduit 15 miles long from the Great Falls of the Potomac. Mount Vernon (q.v.) lies in Virginia about 16 miles S. of the Capitol.

While Washington has few manufactures, no foreign commerce, and but little shipping (being dependent on Georgetown for its small harbour facilities), it has a distinction, as the seat of the general government, to which no other city in the Union can lay claim. The annual assemblage of congress attracts a large influx of visitors from all parts of the country, while the great and far-reaching business of all departments of the government requires a small army of officers and clerks for its transaction. The city is to a great degree populated by the official class, and by merchants, artificers, and small manufacturers who supply their wants. The number of hotels and boarding-houses is very great. A steadily increasing number of people of wealth and taste are building residences at the national capital, where the presence of the diplomatic corps and of travellers and sojourners from all parts of the globe renders the society in a large sense cosmopolitan. The absence of smoky manufactories, the genial and salubrious climate, the pleasant situation and attractive suburbs, with the wide and smooth streets, contribute to render a residence in Washington during most of the year agreeable. The summer brings torrid heats, as in most cities and large towns, though not always long continued. The average temperature of the winter is 36°, spring 55°, summer 76°, and autumn 56°; for the whole year the mean is 56° F.

For the government and history of the Federal City (as President Washington called it, until the commissioners gave it its name in 1791) see DISTRICT OF COLUMBIA, and for Georgetown (created 1751 and incorporated 1789) see GEORGETOWN. The splendid site of the Federal City was Washington's personal choice, though at the time the land E. of the Potomac was but a wilderness. After the Civil War (1861–65) Washington began to move forward in a new career of prosperity. Its unpaved and unsightly streets were taken in hand, its defective sewerage system was radically reformed, its steep grades were reduced, thousands of shade-trees were planted, and the town was transformed in a few years from a neglected and repulsive place to a beautiful and attractive city. Pop. of the City of Washington (1800) 3210; (1830) 23,364; (1860) 61,122; (1880) 147,293; (1900) 278,818; (1920) 437,451, of whom about a quarter were negroes.

For the Treaty of Washington (1871) and the Rules of Washington, see ALABAMA, NEUTRALITY. The Washington Conference of 1921–22 set a check on the navies and naval armaments of the Great Powers, allowing 525,000 tons as maximum tonnage to Great Britain and the United States, 315,000 tons to Japan, and 175,000 tons to France and Italy; the tonnage of capital ships was limited to 35,000 tons, and of cruisers to 10,000 tons, but no limitation was placed on submarines. New rules

of international law were evolved, and the use of poison-gas prohibited in war. The Powers interested in the Pacific pledged themselves to respect each other's possessions, while with regard to China the Five Great Powers, with the addition of Belgium, Holland, and Portugal, agreed to respect Chinese sovereignty and independence.

There are standard histories on the City of Washington by Tindall (1914) and Bryan (1914–16), and smaller works by Todd (1889), Wilson (1901), and Forbes-Lindsay (1908). See also T. E. Page, *Washington and its Romance* (1924).

Washington, BOOKER TALIAFERRO (*c.* 1859–1915), born a coloured slave at Hale's Ford, Virginia, studied at Hampton Institute, Virginia (1872–75), became a teacher and a writer and speaker on negro problems, and in 1881 established the Tuskegee Institute for coloured persons, Alabama. See his *Up from Slavery* (1907) and other autobiographical works, and study by Stowe and Scott (1917).

Washington, GEORGE, was born 22d February (New Style) 1732, at Bridges Creek, Westmoreland county, Virginia; and he died without issue 14th December 1799, at Mount Vernon on the Potomac. He came of good English stock, being descended from the Washingtons of Northamptonshire. At an earlier time the family seems to have lived in the more northern part of England, and we cannot be far out of the way in tracing his origin to the mingled Norse and Angle blood of Yorkshire. In 1658 George Washington's grandfather, John Washington, first appeared in Virginia, and soon acquired wealth and position. He commanded the Virginia militia in the disgraceful attack on the Indians in Piscataway Fort, Maryland. For his share in this enterprise he was reprimanded by Governor Berkeley. The people, however, seem to have been on his side. He died soon after, and took no part in Bacon's rebellion against Berkeley (1676). John Washington's second son, Augustine, was the father of George Washington, by his second wife Mary Ball. Augustine died while George was still a mere boy, leaving a large family, and means inadequate to the upbringing of the younger children.

Nothing is known of Washington's childhood, notwithstanding the many stories which have gathered about his name. He seems to have been a good, healthy boy of strong physique, with a sober-mindedness somewhat beyond his years. In 1747 he went to Mount Vernon, the residence of his half-brother Lawrence, who, as the eldest son of Augustine Washington, had received the better part of the Washington property, and an English education. The removal was a good thing for the boy, as it gave him access to books and to better teachers, and brought him into contact with the Fairfax family, to which Lawrence Washington's wife belonged. His love of hunting seems to have been the thing that attracted Lord Fairfax to him. At all events, in 1748, when Washington was sixteen years of age, Lord Fairfax employed him to survey the property in the Valley of Virginia which he had inherited from the avaricious Lord Culpeper of Charles II.'s time. Surveying alternated with hunting, and the winters were passed at Mount Vernon. Still Washington acquired from these expeditions habits of self-reliance and endurance which such a life alone teaches. In 1751 he accompanied his brother, who was dying of consumption, to the Barbadoes; and this seems to have been the only time he went beyond the limits of the continental colonies. In 1752 Lawrence Washington died, leaving him guardian of his only daughter, and heir to his estates in the event of that daughter's death without issue. Lawrence Washington had seen some service with Admiral Vernon, and, either because he noticed warlike ability in his younger brother or for some other reason, determined to give him a military training. He therefore invited two of his old comrades in war to Mount Vernon, and there in the intervals of surveying and hunting Washington was taught the manual of arms and the elements of the art of war.

The French at this time (1752) were connecting their settlements on the Great Lakes with those on the Mississippi by a chain of posts on the Ohio. This region was regarded as within the sphere of English influence—to apply a phrase of the day to the earlier time. Governor Dinwiddie of Virginia determined to warn the intruders off. He sent one messenger who returned frightened before half the distance had been accomplished. Looking about for a more efficient messenger, his attention was called, perhaps by Lord Fairfax, to young Washington, and he was sent. This time there was no turning back, and the task was performed in the same relentlessly thorough way so characteristic of his later doings. There has come down to us a journal describing this trip, and it is one of the pleasantest bits of writing from Washington's pen. The French, however, paid no attention whatever to his warning. Dinwiddie determined to drive them off by force, and an expedition was sent against them of which Washington was nominally second in command. In reality, owing to the death of his superior, he was in command during the important part of the campaign. The event was unfortunate. Washington was driven back, surrounded, shut up in a little fort commanded by higher ground, and forced to surrender. But he had learned a valuable lesson in military science. It was at this time that an order was issued from the headquarters of the English army to the effect that any field-officer holding a royal commission could command a colonial officer, no matter what the respective ranks of the two men might be. Washington, notwithstanding his love of war, at once resigned. He was induced, however, to serve on Braddock's personal staff, a position which made him independent of the regular officers. In this capacity he gave a great deal of good advice, which was disregarded, and saved the remnant of the van of Braddock's army. He was then placed at the head of the Virginia forces, and in 1756 visited Boston to see General Shirley, the English commander-in-chief, and settle the matter of rank. This was arranged to Washington's satisfaction, and he continued in the service. This journey to Boston and back made Washington's face and figure known to many persons in the Middle and New England colonies, and undoubtedly contributed in no small degree to his selection as commander-in-chief in 1775. For the remainder of the war he did what he could, giving advice to English generals—which was seldom followed—and extorting money and supplies from a reluctant legislature. But barren of tangible results as these years were, they were nevertheless the most important in that formative process which made him the patient, tenacious, clear-headed man of the revolution. This struggling was a mere foretaste of what was coming to him.

The years from the close of the Seven Years' War (1763) to the meeting of the Continental Congress in 1774 are the most attractive in Washington's life. He seems to have had more than his share of love affairs, but none led to marriage, until in 1758 he fell in love with a rich young widow, Martha Custis (1732–1802). The wooing was short, and the marriage was celebrated in 1759. His niece was now dead, and the combined estates of Mount Vernon and of the widow Custis made him one of the richest men in the land. He kept open house, entertained liberally, led the hunting, and

produced honest grain and tobacco. Virginia life in those times was rude and boisterous. Yet one likes to look back on it and see the young Virginia colonel leading the life of his day, such as it was. He represented his county in the House of Burgesses, and acted as vestryman of his parish. From this peaceful life, however, he was once more to emerge and place himself at the head of the resistance to England.

Familiar with war, Washington wished to try all peaceful measures first, and was thus one of the leaders in the anti-importation movements. But as time went on he became slowly convinced that nothing save force would secure to his countrymen their rights. The question at issue was really the same as the dispute about military precedence. Washington, regarding himself and his countrymen as the equals of any subjects of George III., believed in self-government for America, and prepared to oppose coercion by force.

He represented Virginia in the First and Second Continental Congresses, and at once took a leading part. He was no orator like Patrick Henry, nor writer like Thomas Jefferson. But in rude common sense and in the management of affairs he excelled them all. More than this, however, he was the one American soldier of national reputation, and when congress organised the national resistance he was necessarily appointed commander-in-chief. He possessed remarkable powers as a strategist and tactician, but it was as a leader of men that Washington stood forth pre-eminent. There seems to have been something in his bearing and presence to inspire confidence. He also possessed the happy faculty of always rising to the dignity of the occasion, while never going beyond what the occasion demanded. It was this composed, well-dressed gentleman who took command of the New England farmers and mechanics assembled at Cambridge in the summer of 1775. At first he did not understand them, nor they him, but before long he brought order out of confusion, and at the same time won the love and respect of his men. It seems scarcely credible that these half-disciplined, half-armed men should have held cooped up in Boston a comparatively large, thoroughly-disciplined and well-equipped army, and still more incredible that they should have compelled its final departure. Of course the retreat from Concord and the slaughter at Bunker Hill had much to do with it. But these disasters were themselves due to the incompetence of the English commander. Indeed Washington's fame as a military man was dimmed by the incompetency of his opponents. The only really able commander opposed to him was Cornwallis, and he was hampered in the campaigns where they were opposed by the stupidity of his immediate superior. Whether a strong, able man could have brushed aside the besiegers of Boston may perhaps be doubtful. But it can hardly be maintained that such a man would have allowed Washington to save his army in the autumn of 1776, and certainly he would have made such a crushing campaign as that of Trenton impossible. It is a part of the art of war to judge one's opponents correctly, and Washington, judging his opponents correctly, undertook movements which, under other circumstances, should have cost him his army. In fact it may be said that his battle was not with the enemy, but with his friends. His army was always crumbling to pieces owing to short enlistments, and the very necessaries of life were sometimes unattainable. But through it all Washington appears, except on the rare occasions when he lost control of his temper, the same silent, composed, well-dressed gentleman.

The end of the war came, and with it the temptation which comes to successful commanders in civil wars. The army wished to make him ruler of the country—partly through respect for him, partly to secure the pensions and lands which had been promised them by congress. On his side Washington wished to lead his countrymen into orderly government out of the confusion and chaos in which they were then involved. The easy way to the accomplishment of this purpose would have been to make himself the lawgiver. He might even have founded a dynasty. But Washington never for one moment faltered. He had fought the great war to secure the rights of his fellow-countrymen, not for his own aggrandisement. Singularly enough there are persons who almost blame Washington for preferring his country's good to his own greatness.

Washington retired to Mount Vernon and turned his attention to securing a stronger government by constitutional means. The new union seemed falling to pieces. By 1787 matters had reached such a pass that even congress moved, and a convention of delegates from twelve states met at Philadelphia and formulated the present constitution of the United States. Over the deliberations of this convention Washington presided. The government under this constitution began in 1789 with Washington as first chief-magistrate or president.

To his new office he brought the same qualities which had contributed so much to the success of the revolution—the same honesty of purpose and dignity of character. As soon as it was fairly started, the people saw that the new government was entirely unlike the old. It was a strong consolidated government, as the enemies of the constitution declared it would be. Parties were formed, led by Washington's two most trusted advisers, Jefferson and Hamilton. Washington's position with regard to these early parties has been a subject of dispute ever since his death. One set of biographers represent him as standing apart and above faction, as striving to moderate the asperities of political life. They point to the fact that Jefferson, a known opponent of the constitution, was called to the highest position in the cabinet, and assert that upon his retirement the place was offered to Patrick Henry, who had opposed the ratification of the constitution more strenuously than any other man. Another set of biographers represent him as a party man and leader of the Federalist or strong government party. They assert that at the time of his appointment Washington was not aware of Jefferson's opposition to the constitution. They furthermore deny that the secretaryship of state was ever offered to Henry, and point to the fact that Washington called himself a Federalist in a letter written in 1799. Probably there is truth in both views. At the outset it seems that Washington was desirous of enlisting on the side of the new government the ablest men in the country, whether they had approved or disapproved the precise form of the constitution. As time went on, however, it became evident that those desiring greater liberty for the individual would no longer be content with passive opposition. A strong party, almost at once, sprang into life, and began a campaign which has never been surpassed for personal abuse and virulence. Stung by their taunts, Washington lost his faith in American institutions, and went over heart and soul to the Federalist party. He declared in one letter that he had been attacked in such 'indecent terms as could scarcely be applied to a Nero, a notorious defaulter, or even to a common pick-pocket.' In another letter he proposed that none but persons of 'sound politics' should be appointed to high offices in the army, and was doubtful of the advisability of admitting members of the opposition or Republican party to the army at all—

thus proscribing about half the male population of the country as persons who could not be trusted. Fortunately the election which occurred soon after these letters were written turned the government over to the care of Jefferson and the party which abetted 'the nefarious views of another nation upon our rights,' to use Washington's own words. He did not live to see how wholly in the wrong he was, as he died a few months after these sentences were written.

At the outset it seemed desirable to surround the new government with ceremony and show. Washington therefore was accustomed to open congress in person, driving there in a cream-coloured coach drawn by four or six white horses, with servants in livery. He made a speech to the assembled legislators, and they, in return, addressed him—all being apparently modelled on the English customs. Then, too, his receptions were more formal, if possible, than those of royalty itself. Washington held his hand behind his back, and bowed civilly to those who were presented to him. All this savoured of monarchy, and the opposition, seeing their chance, charged that Hamilton and the Federalists intended to introduce monarchy. There is no reason to suppose the charge true—although Hamilton no doubt preferred a monarchical form of government. But the people believed it to be true.

In great contrast to this violence on either side was Washington's farewell address, advising his countrymen above all to 'be Americans.' In fact, of all the many striking things in Washington's life and work his Americanism stands forth. At a time when those about him were provincials he was an American. He thought America should stand aloof from the conflicts of Europe, and inaugurated a policy of neutrality which has remained the policy of the country from his time to ours.

Washington's early education was poor, and he began his life-work at the age when most boys are entering upon a college career. This deficiency in his training was more patent to him perhaps than to any other person. To the very last he was engaged in remedying this defect, and died a fairly well read man in history and politics. He knew no language but his own, but he was familiar with the masterpieces of the English tongue.

For a list of Washington's writings, see Winsor, *Narrative and Critical History of America*, vol. viii. pp. 416 *et seq.* Editions of his works with Life were published by Marshall (5 vols. 1804), and by Sparks (12 vols. 1837); and a new edition of his complete works, containing many unpublished letters and papers by C. Ford (14 vols. 1888–89). The Life by Washington Irving (5 vols. 1855–59; abridged by Fiske, 1888) is noteworthy; also the books on him by Hale (1887), Lodge (1889), B. T. Johnston (1893), P. L. Ford (1896), Woodrow Wilson (1896), Hapgood (1902), and J. A. Harrison (1906); additional *Letters* (1906); H. J. Ford, *Washington and His Colleagues* (1918); Schouler's and M'Master's histories of the United States; and Thackeray's *Virginians*.

Washington and Lee University, at Lexington, Virginia, was founded in 1782 by the Rev. William Graham as an academy at Timber Ridge meeting-house, was afterwards developed into Washington University, and finally received its present name in honour of General Robert E. Lee, who after the Civil War became its president, He is buried in the college chapel, where a noble recumbent statue in marble marks his resting-place.

Washita, or OUACHITA, a tributary of the Red River (q.v.), in Arkansas and Louisiana, noted for its novaculite Whetstones (q.v.).

Wasmes, an important coal-mining and industrial town of Belgium, 6 miles W. of Mons; pop. 15,000.

Wasp, a popular name for Hymenopterous insects belonging to the family Vespidæ, or to closely related families. Thus the Sphex (q.v.) is a wasp in the wide sense, but it is not a member of the family Vespidæ. All the stinging Hymenoptera to which the title wasp may be applied differ from bees (Apidæ) in the character of the first tarsal joint of the hind-leg, which is neither very broad nor very hairy; nor do they store honey as is the habit of so many bees, but feed directly on sweet juices of fruits and on other insects. The true wasps of the family Vespidæ are further characterised by the way in which the anterior wings are longitudinally folded, each being doubled on itself down the middle, and by the nature of the antennæ, which are usually 'kneed' at the end of the first joint, and have thirteen joints and a clubbed end in the males, twelve joints and hardly any apical thickening in the females. Moreover, as is well known, wasps are generally more slender and much less hairy than bees. About 1000 different species of Vespidæ are known; representatives are found in almost every part of the globe; many live socially, and like the social bees have workers in addition to the two sexes; others are solitary in habit and without workers.

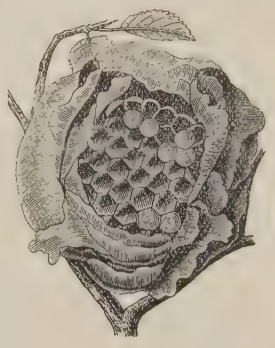
The social wasps—e.g. species of Vespa and Polistes—build papery nests which in intricacy and beauty of architecture rival the achievements of the hive-bees. Begun by the queen-wasp, who alone survives the winter, and completed by those of her offspring who develop into workers, these nests are composed of masticated vegetable matter, generally woody fibres worked into a paste with the viscid secretion of the salivary glands. A variable number of combs, each one cell deep, are connected together by a scaffolding of the same material, and often surrounded by external walls with one door in aerial nests, usually with two in those which are built underground. The cells, which are used as cradles for the developing eggs and grubs, are hexagonal in outline, and their openings generally look downwards. The site of the nest is very varied: the Hornet (q.v.; *Vespa crabro*) usually chooses the hollow of a tree, the common wasp (*V. vulgaris*) builds in the ground, the tree-wasp (*V. sylvestris*) hangs its oval nest from the

Nest of Tree-wasp (*Vespa sylvestris*).

branches of a tree. Moreover, within one species there is no rigid adherence to one situation; thus the nests of the hornet and the common wasp are often built under the eaves of houses. Nor is the framework always of a papery texture, for some species of Polybia common in South America use earthy materials. In size too there is great variety, from a few inches in girth to five feet in

length, and within the same species there are wide limits according to the strength and prosperity of the society.

In illustration of the annual life of the social Vespidæ, the history of the common British wasp may be outlined. As in other wasps of temperate countries, the sole survivor of the winter is a queen or female who has lain in shelter since her impregnation the previous autumn. In early spring she awakens from her torpor and seeks a site for the nest. A suitable hole is found, a foundation of wood-scrapings is laid, a foot-stalk is reared to support the first two or three layers of cells, these are covered by an umbrella-like roof, and an egg is laid in each. More cells are made, and more eggs are laid. As the first laid eggs hatch, the walls of the cells are raised in relation to the increasing size of the grubs, which eventually shut themselves in with a silken lid. During growth, however, they have required food—nectar from flowers, juices of fruits, honey stolen from the bees, and the like—and the mother-wasp has a busy life. But the period of pupation is short, and soon there emerge workers who lighten their mother's labours. They make more combs, the female lays more eggs, more workers are born, and, as autumn draws near, females and finally males. The young females and the males quit the nest in a nuptial flight which secures the continuance of the species, while the workers left in the nest evict the remaining grubs, and themselves await death. In some cases the story is complicated by the fact that the rudimentarily sexual workers may produce parthenogenetic eggs which develop into males. The food of wasps consists of the juices of plants, sweet fruits, the nectar of flowers, and honey-dew, but they are sometimes carnivorous, preying upon other insects, larvæ, spiders, and even on the corpses of larger animals. All who have sat at lunch in the country during a hot summer know with what pertinacious daring the wasps which enter by the open windows attack not sweets only, but all sorts of palatable viands. Although wasps are very destructive of fruits, it must be noted in their favour that many of them destroy other insects, grubs, and caterpillars. The stinging-organ is, as usual, an ovipositor, and not of course possessed by the males. In structure and mode of action it generally resembles that of Bees (q.v.). The poison which enters the wound made by the sharp little instrument produces painful inflammation, especially in the case of hornets, but unless the stings be numerous injurious results are rare. It is well, however, to take means to allay the inflammation —e.g. by hot-water fomentations, or by the homely remedies of indigo-blue and soap and sugar, which are usually sufficiently effective.



Nest of Common Wasp (*Vespa vulgaris*) seen from below.

The solitary wasps, also included in the family Vespidæ, have no workers; they usually build single cells of clay or sand; and they are also distinguishable structurally from the social forms. Thus the mandibles are generally long and narrow, not broad, the tarsal claws are toothed, and so on. They are generally smaller than the social wasps, and darker in colour. The nest is oftenest in a hole, and is very generally provisioned with insects or insect-larvæ for the use of the offspring. A well-known representative is the Wall-wasp (*Odynerus parietum*), common in Britain and throughout Europe; it digs a hole in walls and builds a projecting tubular porch, at first straight, but towards the end bent downwards; the hole is stocked with paralysed grubs and caterpillars, and among these an egg is laid. Other common genera are Eumenes and Pterochilus.

Besides the Vespidæ there are, as has been already noticed, a number of families the members of which may be popularly called wasps. Thus there are the burrowing sand-wasps or Crabronidæ, —e.g. Sphex (q.v.), Ammophila, Crabro, Dinetus, Bembex; the nearly related Pompilidæ, with similar habits—e.g. Pompilius (one species of which preys upon the large spider Mygale), Priocnemis, Pogonius, Cercopales; the Heterogyna—e.g. Sapyga, which usurps the burrows of other insects, and Mutila, whose larvæ are parasitic in the nests of humble bees; the small golden wasps, cuckoo-flies, or Chrysididæ—e.g. Chrysis—which lay their eggs in the nests of bees or wasps. The somewhat rare British Wood Wasp, *Vespa austriaca*, lays its eggs in the underground nest of the Red-legged wasp, *V. rufa;* and no workers are known.

See Bees, Insects, Sphex, Stinging Animals; Lubbock (Avebury), *Ants, Bees, and Wasps;* O. Latter, *Natural History of Some Common Animals* (Cambridge, 1904); G. W. and Eliz. G. Peckham, *Wasps Social and Solitary* (1905); *Wasps*, Misc. Public. Ministry of Agriculture, Whitehall, London (1924).

Wassermann, Jakob, German writer, was born of Jewish parents at Fürth, Bavaria, in 1873, and has lived mostly in Austria. His work—sometimes fantastic, sometimes erotic, but always with an undercurrent of intense seriousness—includes the novels *Die Juden von Zirndorf* (1897), *Die Geschichte der jungen Renate Fuchs* (1901), *Die Masken Erwin Reiners* (1910), *Das Gänsemännchen* (1915), *Christian Mannschaffe* (1919); the historical novels *Alexander in Babylon* (1905), *Kaspar Hauser* (1908); volumes of short stories *Die Schwestern* (1906); and an autobiography *Mein Weg als Deutscher und Jude* (1921). Some of his works have been translated into English.

Waste Lands, according to the general use of the term, are uncultivated and unprofitable tracts in populous and cultivated countries. The term waste lands is not employed with reference to land not reduced to cultivation in countries only partially settled. There is a large extent of waste lands even in the British Islands. Of the 77,800,000 acres which they contain only about 48,100,000 are arable land and improved pasture; 3,000,000 acres are occupied with woods and plantations; about 7,000,000 acres in Scotland consist of sheep-pasture, generally at a considerable elevation, and little improved by art; 8,000,000 acres in Ireland are unenclosed pasture, generally quite unimproved; over 4,000,000 acres are mountain and bog; and the remainder consists of unimproved and very unproductive land of other kinds.

The waste lands of Britain are of very various character. Some of them are bogs, already sufficiently noticed in the article Bog. Others are marshes and fens, generally very near the level of the sea, and often within the reach of its tides, chiefly in the eastern counties of England (see Bedford Level). There are also extensive moors both in England and in Scotland, often of very poor soil, and often also at such an elevation above the level of the sea as to render profitable agriculture hopeless. This is not the case with all the moors, and it is sometimes possible to effect great improvement by drainage; so that land, formerly almost worthless, may be converted into good pas-

ture. The highest sheep-pastures of the south of Scotland have been greatly improved by a kind of superficial drainage (*sheep-drains*), consisting of mere open channels for water; but in the greater altitudes of the Highlands, and amidst their more rugged steeps, even this is out of the question. The chalk *downs* of the south of England may, in great part, almost be considered as waste lands, although in several parts they afford excellent pasture for sheep; while in certain districts they have been found capable of great improvement, in a slow and gradual manner, by tillage and the application of manures. Sands near the seashore are fixed by sowing certain grasses, and are capable of further improvement by cultivation and the application of manures; particularly where the sand is in considerable part calcareous. The most barren and hopeless sands are those which are almost entirely siliceous.

In Scotland, during the first eighty years of the 19th century, a large extent of waste land was by reclamation transformed into fairly good arable land. This process of reclamation was pursued to a lesser or greater extent in all the counties embracing mountain or moorland. It was most active in the northern counties, notably in the county of Sutherland, where between 1870 and 1880 the Duke of Sutherland expended nearly £200,000 in the reclamation of land. The Sutherland reclamations attracted great attention at the time, and were visited by many agriculturists from foreign countries as well as from distant parts of the United Kingdom. Viewed financially the reclamations have not been successful. The cost of the work was great, from £22 to as high as £65 per acre, and the benefits resulting from the reclamation have been lessened by the fall in the prices of agricultural produce. Considerable portions of the land soon returned to a semi-waste condition. The advance in wages and the decline in the prices of agricultural produce between 1880 and 1910 brought land reclamation almost to a stand-still.

See Bog, Common, Drainage, Holland, Irrigation, Landes, Peat, Polder, Warping, Zuider Zee.

Waste Products, Utilisation of.—Of the raw materials used in any manufacturing process a portion is thereby rendered either wholly or partially useless. In many cases this material can be reworked and used over again. This applies particularly to mechanical processes. On the other hand, chemical processes often produce waste products of a totally different nature from the original raw materials, and these may or may not be utilisable.

As examples of waste in mechanical processes, we may take, first, the rubber industry. In the process of manufacture the rubber is masticated between steam-heated rolls, and mixed with the various ingredients until in a semi-plastic condition. It is then taken to the calender rolls and sheeted. From this sheet various articles are built up, either by cutting with a pair of scissors or stamping with dies, and there remains over a considerable portion of the sheet in the form of waste cuttings. These are taken back to the rolls, softened again, masticated, and sheeted, and so used up. The reheating and masticating, however, damages the rubber to a small extent, so that the reworked material is of less value than the original. Take next the case of articles such as envelopes cut from a continuous sheet of paper, or trimmings generally. These can also be used again in the manufacture of paper by wetting them, and putting them back into the beating-engine in the form of 'broke.' They are, however, of very much less value in this form than the original rags or other raw material. Then, again, portions of cloth from the web, or sheets of tinplate left over after stamping out the various articles for which they are used, leave a waste of very small value indeed. Leather cuttings may also be mentioned; these cannot be put together and amalgamated to form a fresh sheet of leather, and were consequently almost worthless until the discovery of a cold method of vulcanising enabled them to be combined with rubber.

As an example of waste produced in chemical processes, we may refer to calcium chloride, which is practically the sole waste product of the manufacture of soda by the Solvay process, and is derived from chalk and common salt, the raw materials. The ammonia and carbon dioxide which play a part in the action are recovered practically without loss in the process and used over again. There are plenty of instances where some use can be made of a waste product, although in many cases no use can be found for the greater part of it, owing either to a limited application for the substances produced from the waste or the small margin of profit obtained, which makes it difficult for the new product to compete with those already on the market. There is no better instance of this than blast-furnace slag and iron slags generally. These are the product of the fluxes added to the furnaces to enable the metal to flow. They collect as a molten mass on the surface of the metal, and are run off before the next charge is added. Road-metal forms one outlet for this material, but the cost of carriage restricts its use to the neighbourhood of the furnaces, and slag is by no means an ideal substitute for natural rocks, as it is too brittle, and breaks with a sharp cutting edge. In fact, considered chemically, it belongs to the same class of substances as glass, and has been used for making glass in the Midlands. For this purpose the slag is run off into a tank, and the other necessary ingredients added while it is still hot. The glass produced is not of high quality, but good enough for rough sheets for roofs, skylights, &c. Slag-wool is another product, which is obtained by blowing steam into the molten slag as it comes from the furnace. The material is then reduced to a thin, fibrous condition, and owing to the multitudinous air-spaces enclosed between the individual fibres it forms an excellent non-conductor for lagging steam-pipes. In this respect it has an additional advantage over other substances used for similar purposes, as it is not inflammable.

By grinding slag and mixing it with lime in carefully measured proportions, it is possible to make a fair substitute for Portland cement. Less has been heard of this in recent years; for, although slag may be a waste product, and therefore obtainable at very small cost, the raw materials for Portland-cement-making—namely, clay and chalk—can also be had extremely cheaply, practically for the cost of digging them out of the earth. Slag can also be used in the manufacture of bricks and paving-stones. The first treatment is to reduce the slag to small lumps or fine powder, for which purposes use may be made of the property of slag, to break up into a powder (slag-meal) when rapidly cooled, or it may be granulated by running into water, or, again, suitable grinding machinery can be employed. The basis of most processes is the addition of a suitable proportion of lime, and subsequently pressing into the required shape of bricks or slabs. In spite of the various uses to which slag can be put, there are still large quantities which remain as waste in the strict sense of the word, no sufficiently remunerative process for their utilisation having been found. Thus, although paving-stones can be made from slag, the price at which they can be sold is not such as to allow of their underselling natural sandstone slabs.

It must not be forgotten that although uses can be found for practically every type of waste in a

chemical laboratory, yet the greater number of these are ruled out of court for practical purposes on account of the expense entailed in carrying out the processes. Take as an instance the much more valuable type of waste obtained in the manufacture of coal-gas. When coal was first distilled for this purpose, the ammonia, tar, and other substances produced were waste products; but they are now utilised for the manufacture of ammonia salts, creosote and disinfectants, benzene and other solvents, naphthalene, anthracene, and the raw materials for the production of dyes and pharmaceutical products. These waste products have now become the by-products of the industry, and the considerable technical value attaching to them enables the waste to be worked up at a very considerable profit. Yet, in spite of this, a great deal of coal-tar must still be regarded as a waste material, especially in the case of small gas-works scattered up and down the country, where the cost of carriage and the disposal of a relatively small quantity of tar products is a serious drawback to their utilisation. Recently, however, a new outlet for this tar has come to the fore. We refer to its application to the surface of roads for the prevention of dust, and many small works have now an opportunity of disposing of their tar locally to advantage. A brief reference may also be made to the production of tar not only in gas-works, but in coking-ovens, blast-furnaces, &c. Here the gas is the waste product instead of the solid or liquid residues, but the former is generally utilised by burning it under the boilers which supply power for working the blast.

The foregoing instances will give a general notion of the principles involved in the utilisation of waste products. For further details and other instances, the reader is referred to the various arts and manufactures described throughout the *Encyclopædia*.

Wasting Palsy is one of the terms applied to the disease described at LOCOMOTOR ATAXIA. See also PARALYSIS.

Wast Water, in the Lake District (q.v.), Cumberland, 14 miles SSW. of Keswick, is the deepest lake in England (maximum, 258 feet; mean, 134·5), 3 miles long, ½ mile wide, 204 feet above sea-level. The scenery is stern. The south-east side gives good exercise for scree-walkers.

Watch. See HOROLOGY.

Watch, on Shipboard, a division of the crew into two—or if it be a large crew into three—sections, that one set of men may have charge of the vessel while the others rest. The day and night are divided into watches of four hours each, except the period from 4 to 8 P.M., which is divided into two *dog-watches* of two hours' duration each. The object of the dog-watches is to prevent the same men being always on duty at the same hours.

'*Bells*' is a term not exactly equivalent to, but serving as a substitute for, 'time' or 'o'clock' in ordinary land-life. Each half-hour is marked by striking on a bell, in either single or double strokes. The number of strokes depends not on the hour, according to ordinary reckoning, but on the number of half-hours which have elapsed in that particular watch. Thus, 'three bells' is a phrase denoting that three half-hours have elapsed, but it does not in itself show to which particular watch it refers, and may indicate either half-past one, half-past five, or half-past nine in the ordinary watches, or half-past seven in the dog-watch.

Watch-night. See NEW YEAR.

Watelet, CLAUDE HENRI, French writer, painter, sculptor, and engraver, born in Paris in 1718, held the lucrative post of receiver-general of finances for Orléans, lost his fortune towards the end of his life, and died 12th January 1786. He wrote novels, plays, *Réflexions sur la Peinture*, a didactic poem, *L'Art de Peindre* (which gained him a seat in the Académie, 1760), a *Dictionnaire de Peinture, de Gravure, et de Sculpture*, and many articles in the *Encyclopédie*. He illustrated his books with vignettes which were much admired.

Water, in a state of purity, at ordinary temperatures, is a clear transparent liquid, perfectly neutral in its reaction, and devoid of taste or smell. Its chemical constitution, indicated by the formula H_2O (molec. wt. = 17·96), is 2 parts of hydrogen to 15·96 parts of oxygen by weight, or very nearly two volumes of hydrogen to one volume of oxygen, which upon combustion form by their combination two volumes of water-vapour. The specific density of water at 4° C. is taken as the standard, and is reckoned equal to unity, or for some technological purposes as 1000. Water is used in the metric system as the means of connecting the measures of length and those of mass: a cubic decimetre measures a litre, and a litre of water at 4° weighs a kilogramme. Similarly the Gallon (q.v.) is ten avoirdupois pounds of water. The specific density of steam, reckoned (ideally) at 0° C., is 0·6235 (air = 1) or 0·0008063 (water at 4° = 1); that of ice is 0·94. If water be cooled to 0° C. (32° F.), it freezes if it be maintained at or below that temperature; it *may* be cooled even to − 10° C. (14° F.), if it be free from air-bubbles and kept very steady, without solidifying; it then has a sp. gr. of 0·998145; at − 5° C. it has a sp. gr. of 0·999118. If a block of ice at say − 10° C. (14° F.) be heated, its temperature first rises until 0° C. (32° F.) is reached; its specific heat during this stage is 0·502°; when it reaches 0° C. the ice begins to melt, but the temperature becomes stationary, remaining at 0° C. until all the ice has been melted. This takes place when 80·025 gramme-calories of heat per gramme have been absorbed; the latent heat of water is thus said to be 80·025. The water at 0° C. occupies less volume than the ice in the ratio of 94 to 100 nearly. At 0° C. the sp. gr. of water is 0·999871. As the heating is continued the temperature rises; the specific heat in this stage is 1, water being the standard substance for the measurement of specific heat; at 4° C. (39·2° F.) the sp. gr. is 1·000, water being then at its maximum density. There is thus a shrinkage in bulk between 0° C. and 4° C.; but as the heating is continued the water begins to expand, the specific heat slightly increasing; at 10° C. (50° F.) the sp. gr. is 0·999747; at 50° C. (122° F.) it is 0·9882; and at 100° C. (212° F.) it is 0·95865; thus 1 volume of water at 4° C. becomes 1·043 volumes of water at 100° C. As the heating is continued the water begins to boil: the temperature remains constant, apart from irregularities induced by superheating and consequent explosive bubble-formation and the presence of impurities (see BOILING-POINT): this goes on until the whole is converted into steam. Heat is absorbed in this operation equal to 536·5 gramme-calories per gramme. This steam has a temperature of 100° C.; its specific density will therefore be (273 ÷ 373) × 0·0008063 = ·00059014, and it will occupy 1694·5 times the bulk of the water at 4° C. If the steam be still further heated, it expands or exerts pressure like an ordinary gas: its specific heat is 0·4305 at constant pressure, 0·2989 at constant volume. If water be heated in closed vessels beyond 100° C., it exerts great pressure on account of its own expansion and its tendency to form steam; but it has been inferred from the variations in the latent heat of evaporation of steam at different temperatures that, if water could be exposed to a temperature of 720·6° C. without

bursting the containing vessel, it would present the phenomena of the critical state (see GAS, &c.).

Water dissolves a great many substances, forming aqueous solutions. Its solvent powers for solids and liquids are in general increased by heat, while those for gases are diminished. When water is superheated (above 100° C., under pressure) it can even decompose some silicates such as plate and crown glass and extract the alkali, leaving silica. The following proportions by volume of the respective gases are soluble in water under a pressure of 76 cm. mercury column at 0° C. (32° F.) and 20° C. (68° F.) respectively: hydrogen, 0·0193 and 0·0193; nitrogen, 0·02035 and 0·01403; atmospheric air, 0·02471 and 0·01704; carbonic oxide, 0·0329 and 0·02312; oxygen, 0·04114 and 0·02838; carbonic acid, 1·7987 and 0·9014; sulphuretted hydrogen, 4·3706 and 2·9053; sulphurous acid, 79·789 and 39·374; ammonia, 1049·6 and 654·0. In some cases there is heat evolved when the gases dissolve. Hydrochloric acid evolves heat, but this is not a case of simple solution; there is some chemical combination; the gas and the water do not part company when heat is applied, but gas or water is given off until the solution attains a particular strength, after which it distils bodily. Some liquids dissolve in water by a process of interdiffusion; and salts dissolve each in its own proportion, which varies with the temperature. Heat is often evolved by the act of solution if there be chemical combination between the salt and the water with formation of *hydrates*; but if there be no such union, then the absorption of heat in liquefying the salt results in cooling. These two effects may more or less completely balance one another. Water may combine with an anhydrous acid, playing the part of a base and forming a salt of hydrogen, with evolution of heat: thus $SO_3 + H_2O = H_2SO_4$, sulphuric acid or hydrogen sulphate, analogous to K_2SO_4, potassium sulphate. Similarly it may combine with an anhydrous base, forming a hydrate: $K_2O + H_2O = 2KHO$. In these cases the water cannot, in general, be expelled by simple heating. When it combines with salts, being taken up by them in the act of crystallising, it is in many cases essential to the form of the crystal, but can be expelled by heating; the crystal in that event crumbling into powder: and such water contained in a crystal is called *water of crystallisation*. Beyond this there is often some *water of constitution* present: if the attempt be made to drive this off by continued or higher heating, the salt is decomposed. Crystals of sulphate of iron, $FeSO_4,H_2O + 6H_2O$, illustrate this; on gentle heating, the water of crystallisation is driven off and $FeSO_4,H_2O$ is left: if this be further heated it is decomposed (see SULPHURIC ACID).

Water is very slightly compressible: a pressure of 1 dyne per sq. cm. causes a reduction in volume of 1–20,700,000,000th; a pressure of one atmosphere (1033·3 dynes per sq. cm.) one of 1–20,033d. For many practical purposes, therefore, water may be regarded as incompressible. In the liquid state it is colourless in small quantities, blue-green in large masses, and blue in still larger masses: and it has a refractive index of 1·3324 for the sodium line D at 15° C. In the form of ice its crystals have forms derived from the rhombohedron and six-sided prism, and are doubly refracting, with an index of 1·3060 for the ordinary and 1·3073 for the extraordinary ray (red light). Water-vapour has a refractive index (Mascart) of 1·000257. Water is slightly diamagnetic, and in the pure state has no electric conductivity. The least trace of substance in solution confers electric conductivity upon it; and then, when a currrent is passed through it, it is decomposed or *electrolysed*, hydrogen being set free at the negative electrode as if it travelled with the current, and oxygen at the positive electrode (against). Water-vapour may be decomposed by a very high temperature; and this limits the temperature attainable in the oxyhydrogen flame, for the combination of oxygen and hydrogen is arrested when a certain temperature has been reached. Water-vapour is readily decomposed by oxidisable substances, such as glowing iron or coke; but the heat must be kept up in order to supply sufficient energy for the decomposition of the water-vapour. In the former case the products are hydrogen and magnetic oxide of iron; in the latter, water-gas. But if hydrogen is passed over glowing oxide of iron or copper, the oxide is reduced to metal, and water-vapour is formed.

Absolutely pure water is not to be found in nature, since water always finds something to dissolve even as it falls through the air in the form of rain: rain-water contains not only atmospheric air (2½ vols. per hundred), but also some ammonia and carbonic acid and traces of nitrates, together with salts derived from dust. The principal tests to which water is subjected in order to determine its impurities are examination of colour, taste, smell after being shaken up; analysis of the residue left after evaporation, for silica, iron, alumina, lime, and magnesia; acidifying with hydrochloric acid, and estimating the sulphuric acid by means of barium chloride; determination of the chlorine present; estimation of nitrates and nitrites (these being of importance as indicating oxidised organic matter and showing that the water had passed through organic matter); determination of the free ammonia and of the total amount of ammonia producible by reductive processes from the organic matter present in the water (albuminoid ammonia); estimation of the carbonic acid. The hardness of water is determined by making a solution of soap of such a strength that a standard volume of it will take a given quantity of barium chloride, and then be just able to froth on shaking. This standard soap-solution is then dropped into a measured quantity of the water to be tested, which is shaken after each addition, until frothing begins: from the quantity of soap-solution used, with the aid of a table (for the quantity of lime or magnesia salts present and the quantity of soap-solution used are not directly proportional to one another), the total hardness—i.e. the quantity of lime salts present, which curdle and waste soap by forming insoluble lime-soap—is determined. In another sample the carbonates of lime and magnesia are removed by boiling, and the above test then applied after cooling: this determines the 'permanent hardness,' due to sulphates of lime and magnesia. In both cases control experiments are made by removing the lime and magnesia by means of oxalate of ammonia, and then testing with soap. The results are expressed in 'degrees of hardness,' which in England mean grains of $CaCO_3$ (or their equivalent in magnesia carbonate, or in sulphates of lime or magnesia) per gallon, in France centigrammes $CaCO_3$ per litre, and in Germany centigrammes CaO (or its equivalent in MgO) per litre.

The question as to who was the discoverer of the composition of water—the great Water Question—takes rank in the history of chemistry as the controversy as to the discovery of the calculus and of the planet Neptune in other sciences. Brougham, Brewster, Kopp, Arago, Dumas, and many others have maintained one or another of the theses; and the claims of Cavendish, James Watt, Priestley, and Lavoisier have been canvassed and defended. Research seems inclined to give the priority to Cavendish, while allowing that Watt made independent experiments and came to similar results soon after.

See Dr George Wilson's *Life of Cavendish* (1846); Muirhead's *Watt* (1854); and Thorpe at the British Association in 1890. See also articles on Sea, Mineral Waters; and on Boiling-point, Evaporation, Freezing Mixtures, Heat, Hydrogen, Hydrostatics, Ice, Melting-point, Oxygen, Rain, Refrigeration, Snow, Solution, Specific Density, Steam. For Water on the Brain (or in the Head), see HYDROCEPHALUS.

WATER-POWER.—The utilisation of water-power by means of mechanical contrivances dates far back into the world's history. The ancients fully appreciated the advantages of the water-wheel, employing it mainly for the purpose of lifting water for irrigation purposes. The Greeks carried

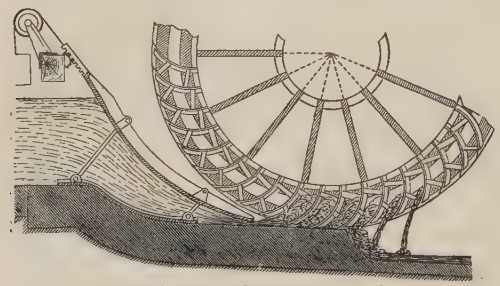


Fig. 1.—Poncelet Water-wheel.

the development of the use of water-power to a more advanced stage. But there was but little real progress in the use of water-power until towards the end of last century, up to that period practically the only form of water-motor in use was the water-wheel, in one or other of its three types—overshot wheels, breast wheels, and undershot wheels. Water-wheels were poor in efficiency, even the very best not reaching more than 60 per cent. They were available only for falls varying from about 6 to 70 feet, and were exceedingly cumbersome and heavy for the amount of power generated, which was, even in the case of the largest wheels, only sufficient to operate a single factory. They are now only found in remote country districts and only used to drive saw-mills and for power purposes on farms, &c. The Poncelet wheel, suitable for falls not exceeding 6 feet, illustrated in fig. 1, utilises the impulse of the water, the vanes being so designed as to reduce all shock and other losses to a minimum.

Direct acting motors, whose action is similar in principle to that of the ordinary non-condensing steam-engine, have not proved very successful owing to the practical difficulties in securing simple and reliable automatic regulation of the amount of high-pressure water delivered to the motor, as the power demanded from the motor varies up or down. One of the most successful motors of this type was that designed by Rigg (described in *Engineering*, Vol. XLV. p. 61). To this type of motor, in which high-pressure water acts upon a piston or ram moving to and fro in a cylinder, belong the well-known hydraulic lifts, employed in lofty buildings for passenger and goods traffic from the street level to the upper floors. The recent development of deep level electric railways in cities has involved the construction of very large hydraulic lifts for the conveyance of passengers up or down between the street level and the underground railway stations. Hydraulic lifts require, when the lift is considerable, some automatic contrivance for the purpose of balancing the varying displacement of the lift ram, and the best arrangements for this purpose are some form of hydraulic balance. Hydraulic lifts are now, however, being replaced by electrically operated lifts, which are more easily installed in buildings, and more suitable for rapid lifting work.

The introduction of the water-turbine, and later of the Pelton water-wheel, has entirely revolutionised the whole problem of the utilisation of water-power, and so rapid has been the advance during recent years that in many countries such as Canada, Norway, Sweden, Switzerland, Italy, New Zealand, the amount of power developed hydraulically exceeds that from any other source of energy.

This rapid advance has been rendered possible, not only by important improvements in the design and governing of large turbines and Pelton wheels, but also by great improvements in the design of electrical machinery. The source of the water-power may be many miles distant from the city or district in which the power is to be utilised; nevertheless, by the direct drive of large electrical generators, by large turbines or water-wheels, by the generation of the electrical energy at high-tension, and by the transmission of this high-tension current by means of overhead wires, power may be distributed from the central power-house over a wide extent of country. The high-tension current is reduced to the required voltage at sub-stations at any place at which the energy is to be utilised for electric lighting, for electric railways and tramway systems, or for factories of all possible sizes and types; for example, the city of Buffalo in the United States draws all the power it requires for various purposes from Niagara Falls many miles distant, where the hydraulic power available is converted into high-tension electrical energy. In Great Britain the biggest development of this

Fig. 2.—Runner with Single-bolt Bucket Attachment for a 15,000 h.p. Pelton Wheel.

source of energy has been in Scotland, the Kinloch-leven power-house output is mainly employed in the manufacture of aluminium. The processes required in the conversion of the raw material into aluminium being only possible where there are available large quantities of electrical energy, produced at a cheap rate. Further large hydro-electric schemes are now in course of construction in the Highlands, while the proposed Severn barrage

scheme will, if it is eventually carried out, provide a large amount of water-power for the industrial areas of the south Midlands of England. An important government commission has examined the water-power potentialities of the whole of the empire; their valuable reports show what a splendid asset those water-power possibilities will be to the empire as they are gradually developed and utilised for industrial purposes. The turbine and the Pelton wheel have, in fact, now become the most efficient of all the various types of prime movers employed by man.

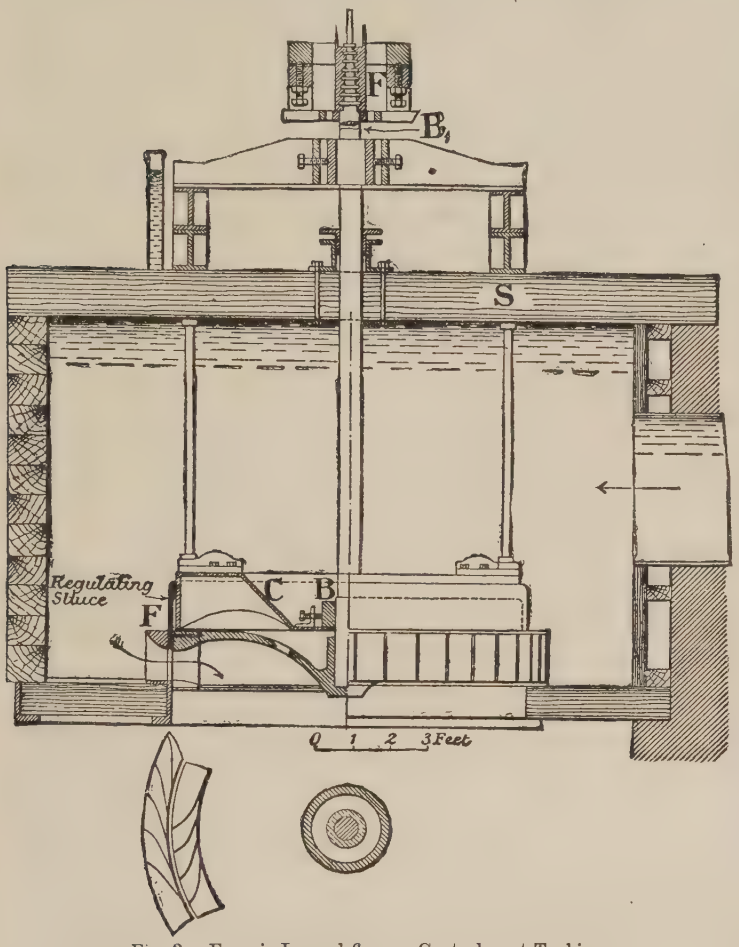


Fig. 3.—Francis Inward-flow or Central-vent Turbine.
Reproduced by permission from Professor Lea's *Hydraulics* (Edward Arnold & Co.).

The *Pelton wheel* (fig. 2 shows the runner of a 15,000 h.p. wheel) is the most suitable motor for very high heads up to 2000 feet. The wheel has a series of cups placed at uniform distances apart around its circumference; jets of water are so delivered to the cups they strike, and the cups have their interiors so shaped, that practically the greater part of the kinetic energy of the water is delivered to the wheel. If the linear speed of the centre of the cups is one half of that of the jet as it strikes the cup, then it can be shown, neglecting all losses, that the efficiency of the wheel would be 100 per cent. Many large Pelton wheels have in actual use an efficiency of 80 to 85 per cent. when working under full load; even when working under reduced loads the efficiency of the wheel is high when the automatic needle-controlled type of nozzle has been used. This method of controlling the volume of water delivered by the jet, without altering its shape or direction, has overcome many of the original difficulties met with when using this type of motor for generating electrical energy.

Turbines.—These are usually horizontal wheels with vertical axes receiving and discharging water in various directions; they may be divided into three classes according to the direction in which the water moves before it reaches the guide-blades and after leaving the wheel—viz. (1) parallel, (2) outward, (3) inward flow turbines. There is, however, a fourth class often termed mixed flow, in which the flow is partly radial inward and partly axial or parallel. The modern turbine owes its origin to Fourneyron, who realised that in order that the water might leave the wheel without waste of its energy it must receive some initial forward velocity before entering the moving wheel; for this purpose he introduced guide-blades—this was the main feature of his epoch-making invention An inward flow type of turbine is represented in fig. 3, the water admitted all around the circumference passes through the guide passages formed by the guide-blades, and is then delivered to the circumference of the revolving wheel in such a way as to avoid all shock at entrance, and it eventually leaves the wheel in a direction parallel to the axis of the turbine.

The original Niagara turbines were of the Fourneyron type, mounted in pairs on hollow vertical steel shafts, the head of water available being 136 feet. Since the dead weight of the turbines, the moving parts of the dynamo and the shaft was about 68 tons, a special device had to be adopted to reduce the load upon the shaft bearings; the water from the penstock, as it passes through the guide-blades of the upper of the pair of turbines, presses in an upward direction upon the cover of the turbine, which therefore acts as a kind of balance piston.

In the well-known hydraulic ram the energy of a mass of water descending from a small height is utilised to raise a small portion of the mass through a considerable height; it is entirely self-acting. In the jet-pump, the water-blower and the injector, a stream of liquid moving with a certain velocity drives and carries forward with it an additional stream, the two streams finally mingling together and moving with a common velocity less than the original velocity of the driving stream.

For further details about Turbines and Water-wheels of different types see Lea, *Hydraulics;* Gibson, *Hydroelectric Engineering;* and many papers in the *Transactions of the Institutions of Civil Engineers* for the years 1890 onwards, Reports of Commission on Water power Resources of the Empire. See also ARCHIMEDES'

Screw, Barker's Mill, Blowing-machines, Crane, Hydraulic Press, Hydraulic Ram, Hydrodynamics, Pumps, Injector, Tidal Power, Transmission of Power.

Water-supply.—In old times kings and communities made artificial channels and conduits to convey good water in large quantities to important towns. Hezekiah made a pool and a conduit and brought water into the city; and the remains of Roman aqueducts in the Campagna, near Nîmes, and in many parts of the world give evidence that water-supply was well cared for in past ages (see Aqueducts). The fact that water would, in an inverted Siphon (q.v.), stand at the same level in both legs must have been observed; and it could not have been from ignorance of this circumstance that water was not conveyed across deep valleys by means of siphons. Indeed, it appears that in the time of the Emperor Claudius there was constructed a conduit 13 leagues in length to supply a palace near Lyons; it traversed eight valleys by means of masonry aqueducts, but in the case of the ninth valley the water was conveyed across by an inverted siphon, consisting of nine lines of leaden pipes, each pipe being 8 inches diameter and 1 inch thick. No doubt, therefore, it was the want of any such material as cast-iron for large pipes, and the consequent necessity of multiplying small pipes (small, to resist the pressure) in lead or in wood, that caused the hydraulic engineer of those days to prefer the grand masonry aqueducts.

Sources of Supply.—These sources all owe their being to that great heat-engine the sun, which vaporises the waters of the sea and produces the currents of air that convey these vapours to the land, where they are condensed into mist or rain or dew, and are gathered from little rills and streamlets into rivers, falling eventually into the ocean, with or without the intermediate receptacle, the lake; or, on higher grounds and in colder regions, fall as snow. Not only does the sun raise vapour from the waters of the ocean, but also from the surface of lakes and rivers, and from the moist earth and its vegetation, and even from the surface of ice, and does so without bringing that ice into the liquid condition. When the nature of the soil is favourable, a very large portion of the rainfall sinks in and traverses below by percolation, or in fissures, producing *Springs* (see Spring); or else it continues its concealed course the whole way to some river or to the sea, where it is sometimes delivered below high-water mark, so that in places fresh water can be gathered from among the shingle directly the ebbing tide has removed the cover of salt water. Under all circumstances the cycle—of evaporation, transport of vapour, condensation, and return to the liquid state, to be again evaporated—goes on, and thus, in the words of the Wise Man, 'All the rivers run into the sea, yet the sea is not full; unto the place from whence the rivers come thither they return again.' Springs may be found in proximity to a population, and issuing at a sufficient height to supply that town by gravitation. But more commonly springs issue at levels not sufficiently elevated to supply a town directly, and then recourse must be had to pumping. In mountainous countries it is quite possible to find *streams* near towns at such elevations as to admit of a supply by gravitation; and for towns more remote, it is a mere matter of engineering to convey the waters of such streams by means of built aqueducts and pipes, so that the pressure (less the loss needed for 'head' to produce the flow) shall be maintained, and the distant town shall still be supplied by gravitation. In a plain country, far removed from an elevated supply, the best plan may be to pump from the neighbouring river. *Wells* in almost all cases demand the use of pumping-power. For even in true Artesian Wells (q.v.), those which overflow, it is rare that the mouth of the well is at such a level as to enable a supply to be given by mere gravitation. The spring and the river are natural supplies; the well is a product of art. The rainfall from a gathering-ground is usually stored in an artificial reservoir, generally formed by damming up a valley; but natural lochs have occasionally been adapted for the purpose by the provision of suitable arrangements for drawing off and regulating the water.

Quality of the Water.—That from springs may be of almost any character. But the water of such springs as are used for waterworks purposes is generally clear and bright, acceptable to the palate, and frequently 'hard.' So commonly is deep well-water. Not only is there provided a natural means for the aeration of spring and well waters; but this aeration burns up the organic matter brought down from the surface. It is extremely instructive to notice how a pervious soil—a chalk soil, for example—'breathes,' taking in and expelling air and gases. The breathing, it is true, is long-drawn and irregular, as it depends mainly, if not entirely, on the variation in the barometer. This breathing may readily be observed by closing the folding-doors over a chalk well and applying a lighted candle to the bucket-rope hole, when there will be found an indraught or an outdraught, as the case may be, varying in intensity according to the suddenness and extent of the recent barometrical change. But, though as a general rule springs and deep wells may be relied on to produce water uncontaminated by any matter detrimental to health, there are cases where such waters have been defiled, and are not sufficiently purified by the aeration above mentioned.

A river-supply will be influenced by the character of the gathering-ground, by the amount of spring-water which makes its way into it, and by the condition of the districts through which it passes. Experience has shown that the quality of a river-supply is much improved by storage antecedent to filtration and distribution. The quality of the supply for an impounding reservoir depends on the purity of the gathering-area, on its freedom from cultivation, and on the presence or absence of peat.

Filtration, &c.—Waters which in their state of crude supply would not be potable may be rendered perfectly so, and in fact may be distributed in a condition which makes them superior to other waters deemed sufficiently good to be used without any treatment at all. Storage and efficient filtration will render water that is cloudy, owing to suspended matter, perfectly bright and clear, and it is now well established that filtration has a most important effect in the removal of germs. If possible, river-water is not taken even into a depositing reservoir during times of excessive flood; but when received it is allowed to remain for a time before passing to the filter-beds. A filter-bed is usually thus constructed: A water-tight tank is provided of some 10 feet deep, and of such area as may be determined upon—an acre is not unusual for large works; the bottom of the tank is formed with a slight fall from all directions towards a draw-off outlet. On the floor of the tank closely packed rows of tile drains, or a double tier of bricks, or broken stone, are so arranged that while presenting a surface to support the filtering material which rests upon them they afford a free flow for the filtered water to the main outlet drain from the filter-bed. On this foundation is laid coarse shingle, then finer, then gravel, and finally sand. The whole thickness from the top of the coarse material to the top of the sand may vary from 2 to 4 feet. The water to be filtered is maintained on the sand-surface to a depth probably

of 3 feet, more or less, while the outlet valve is adjusted to give such a difference between the level of the water on the filter-bed and that in the outlet as will provide the 'head'; this head should not exceed about 2 ft. 6 ins. needed to cause the water to traverse the sand at the desired rate. This rate varies very considerably, say from forty to eighty gallons per superficial foot in twenty-four hours; a very fair rate is fifty gallons. It is advisable in the neighbourhood of towns to cover the reservoirs in which the filtered water is stored. For long it was not suspected that in arresting microbes, pathogenic and other, a sand-filter is not effective until a fine film of mud (with microbes in it) has been formed on the surface of the sand. This is now fully recognised. See FILTER.

Instead of slow filtration in open sand-beds, so-called mechanical filtration has recently come more into use. The term 'mechanical filtration' is generally applied to rapid filtration through comparatively small areas of sand, quartz, &c., which are cleaned by reversing the direction of the flow so as to wash away the suspended matter which has accumulated on the surface. Mechanical means are generally provided for the purpose of agitating the sand during the washing process. A coagulent, usually sulphate of alumina, is in most cases added to the water before filtration so as rapidly to form a skin or film on the surface of the sand, without which good results cannot be obtained. This film consists of an insoluble hydrate of alumina, formed by the combination of the alumina sulphate with the carbonate naturally in the water or added for the purpose. With such mechanical filters the rate of filtration may be as high as 2000 gallons per square foot of sand surface per diem.

The quantity that can properly be filtered per superficial foot per twenty-four hours being known, it is easy to determine what size and number of filters will be needed in work for any given supply; e.g. at fifty gallons per foot 20,000 superficial feet, or, roughly, half an acre, would be required for one million gallons per day. But there must be in addition a reserve filtering area to allow for cleaning. This cleaning consists of scraping off the upper layer of the sand upon which has been deposited the suspended matter extracted from the water. Practice differs somewhat as to the time at which the sand is washed and replaced. Cleaning may be necessary after 8 to 10 days' working or may not be needed till four weeks have elapsed since the filtration process started.

Softening.—Well-water and spring-water, if hard, generally contain in solution magnesia or carbonate of lime, or both. The carbonate of lime water can be softened by Dr Clark's process, as follows. Ordinary quicklime is agitated with already softened water, by a mechanical stirrer, or by blowing in air. After the agitation the water is allowed to settle, resulting in the production of a perfectly clear water containing dissolved (not suspended) lime. A certain quantity of this lime-water—a quantity varying with the nature of the water to be softened, but very commonly $\frac{1}{8}$ of the hard water, or $\frac{1}{9}$ of the whole—is then allowed to run into the softening tank; the water to be softened is delivered into this same tank, and so as to mix with the lime-water. On the mixing of these two clear fluids they immediately become milky. The explanation of this process is that the carbonate of lime is soluble in water, because the water contains free carbonic acid, and that the addition of the quicklime absorbs this carbonic acid, making the quicklime into a carbonate, and rendering the water incapable of continuing in solution the carbonate of lime it originally contained, or of dissolving the newly formed carbonate of lime. When the softening reservoir has been filled the water is allowed to stand until, the whole of the carbonate of lime having settled at the bottom, the water remains perfectly bright and clear. This is then drawn off by a hinged draw-off suction-pipe having a floating end which takes the water at about a foot below the surface, and falls as the water is pumped away. As soon as the suction-pipe approaches the sediment in the bottom the drawing-off is stopped, and the softening tank is re-charged for another operation. From six to twelve hours is a sufficient time to allow for the settling. By this process water of 17 to 20 degrees of hardness is readily reduced to a hardness of from 3 to 4 degrees.

Hard and Soft Water.—It is now generally recognised that on the score of health there is nothing to choose between these. Hard water is brisker and more agreeable to the taste, and has a better colour and appearance than soft water as derived from ordinary impounding reservoirs. For general manufacturing purposes the advantage is with the soft water.

A difficulty attending the use of an extremely soft water is its power of attacking the leaden service-pipes and of causing Lead-poisoning (see LEAD). Reference in this connection may be made to the steps taken by the Sheffield and Birmingham authorities to overcome trouble on this account by adding about a grain per gallon of powdered chalk to the water.

Distribution.—The object is delivery into every house, and, within reason, to the top story of the houses; and also to provide an efficient supply for the purpose of fire extinction. Assume that, either by gravitation or by pumping, the necessary pressure is obtained, the engineer then has to consider his system of distributing mains. These will vary in size from the large arterial mains supplying whole districts down through the lesser diameters supplying groups of streets, or a single street, to the small service-pipe which conveys the water to a single dwelling.

As to the flow of water through pipes, the 'heads' producing the flow being equal in two cases, and the lengths of the pipes being equal, the quantity delivered in a given time will vary as the square roots of the fifth powers of the diameters. That is, if a pipe of a diameter of 1, and of a length of 1, will, under a head of 1, in a time of 1, deliver a quantity of 1, then a pipe of a diameter of 2 will, all other things being equal, deliver a quantity of $\sqrt{2^5} = \sqrt{32} = 5{\cdot}656$ times the quantity.

Quantity required per Head.—A town supply may be divided into three distinct provisions—that used for domestic purposes proper; that used for municipal purposes, such as road-watering and drain-flushing; and that used for trades. When the supply is computed to allow for all purposes, it is clear the quantity must vary greatly in different towns. For domestic and such municipal purposes as road-watering and drain-flushing, it is found that an average of 30 gallons per head per day is enough, even when considering the needs of a strictly water-closet town, and with a liberal allowance of fixed baths and of hot-water apparatus.

Waste-prevention.—This quantity is frequently exceeded, and various methods have been adopted for determining where the surplus quantity or waste has gone. For many years it has been, as will presently be explained, the practice of water engineers to send men out with stethoscopes, which, when applied to the spindles of valves and stop-cocks, indicate whether or not water is passing at unusual times. The observation and detection of waste has, however, been very much facilitated by the use of an inexpensive form of water-meter introduced by the late G. F. Deacon, for many years engineer of the Liverpool Corporation. For

the purpose of detecting waste the area of supply is divided into a number of districts, the supply to which can be tested one by one by means of the meter. The meter is so constructed that the water in flowing through presses on a metallic disc, suspended by a counter-weighted wire, and capable of moving up and down in a vertical truncated cone. The parts are so proportioned that the height of the disc in the truncated cone is an index of the quantity flowing per hour. By means of a pencil attached to the wire, this height is automatically marked on a paper wound around a drum which revolves, by clockwork, once in twenty-four hours; the paper is ruled with vertical lines representing time, and with horizontal lines representing the rate of flow in gallons per hour. It is therefore easy to determine at a glance what has been the rate of delivery at all times during the twenty-four hours, and also, by computing the area of the space bounded by the pencil line, to determine the actual quantity in any given time. In an ordinary district requiring little but a purely domestic supply it is to be expected that the flow from midnight to, say, 5 A.M. should be practically nil, while between 6 A.M. and 10 or 11 A.M. the maximum should be reached. If therefore, on examining the curve drawn on the paper, it appear that during the hours shortly after midnight the passage of water through the meter was but small, and that the increased flow shown in the morning hours, and at the other hours when meals are being prepared, was relatively large, then it may be fairly assumed that all is in order. If, however, the paper reveal that in the hours closely following midnight there was a delivery so large that the increased quantity of the maximum hours formed but a small percentage of the quantity passing during the night hours, then it may safely be assumed that there is great waste going on. On this being observed the district is perambulated at night, and the key with which the stopcocks external to the consumers' premises are worked is applied to all the houses in succession, and is used as a stethoscope to ascertain by the sound whether or not water is flowing into the house; if it be heard to do so, the cock is shut, and the time is noted. This course is pursued throughout the district; very probably not more than 5 or 10 per cent. of the houses will have given evidence of waste; but on revisiting the meter it will be found that at the times corresponding with those in which the cocks were shut there was an instant decrease in the rate of flow, and that the whole rate has now fallen to that which is permissible during the night hours. On inspecting next day the houses which had been shut off, it will commonly be discovered that there was not any ball-tap to the cistern, or that there was a burst service-pipe across the courtyard below the surface, or that there was some other source of waste. That this is sheer waste, of no use to the occupier, is made clear by the consideration that the delivery of water is going on in the dead of night, when he is utterly unconscious of the fact, and although it goes on the whole twenty-four hours round, the occupier is during his waking hours equally unconscious of it, and makes no use of the water. If a slight house-waste only be going on, and the stopcocks be closed, and if it be found on returning to the meter that the heavy night flow is continuing, then the water authority must proceed at once to make an inspection of its own pipes, to find out where the leak is taking place. Thus the waste-water meter is of service to detect waste in the pipes external to the houses, to detect waste within the houses themselves, and also to show the quantity of water really *used* within the houses.

Not only does the waste of water involve extended outlay, and the appropriation of gathering-ground which may be sorely needed by a neighbouring town, but it involves renewing the distributing system with larger mains by reason of the excessive loss of pressure which arises from the demand for increased quantities. This loss of pressure both precludes the possibility of playing a useful jet from a hydrant for the extinction of fires, and also prevents the water from rising to a reasonable height in the houses.

Water authorities in Great Britain are authorised to make rules in terms of the Water Works Clauses Act.

Some of those who look approvingly on a large delivery of water allege that at all events it is of benefit to the drains. This is a mistake; the water from a uniform leak of many gallons per hour has no power to act as a flush; but this large delivery of water has an effect on the sewerage, and one of a most disastrous character—viz. that the volume is so much increased as to add materially to the difficulty of disposing of the sewage either on land or by precipitation, while it also adds to the first cost and to the annual cost of pumping, where pumping in necessary.

Selection of a Source.—When the average daily quantity of water needed, allowing for increase of population twenty to forty years ahead, has been determined, it then becomes necessary to see how it is to be obtained. If there be in the neighbourhood an adequate spring, or a river of satisfactory purity, the minimum daily flow of either of these is generally known, or can be approximately ascertained, and it will at once appear whether, taking into account other interests, the needed quantity can be drawn daily from the spring or from the stream. If, having regard to the geological character of the neighbourhood, it is deemed expedient the supply should be from deep wells, then there is generally evidence at hand as to the height at which the water stands at different seasons of the year and in different years in such wells, when pumping is not going on, and how much the level is lowered with different rates of pumping, and how far this pumping affects neighbouring wells. If the indications are satisfactory, trial borings are made, and the yield is tested. In some cases the supply afforded from one or more bore-holes suffices; but frequently it is found necessary to sink a well, shutting out by means of cast-iron lining, or 'tubbing,' all surface-water, and when a sufficient depth is reached to drive adits—preferably at about right angles to the direction of flow of the underground water—so as to intersect the various fissures through which the water may be running. These adits may themselves be provided with bore-holes.

There is a prevalent and mistaken notion that pumping from the chalk, in a chalk valley, in which there is a stream, must diminish, *pro tanto*, the quantity of water flowing in that stream. No doubt, if the pumping were to take place at some point just above where the chalk spring gushes out to feed the river, this would be true; but, as a rule, the pumping does not take place in such a locality, but in situations where, when no pumping is going on, the water is many feet, not infrequently 60 feet, below the level of the water in the river. The fact that the water is at 60 feet below the river is proof that the abstraction of water at that point cannot influence the river; but what it does is this: it lowers the level of the water at the well, making a cone of depression for a certain distance round the well, and bringing to the surface and rendering useful that which otherwise would have passed away to the sea, invisibly and uselessly.

Where neither spring, river, nor well supply is available, and recourse must be had to gathering-

grounds and impounding reservoirs, then arise the anxious questions: how near, and at what elevation, can the needed area of gathering-ground be found? how much water will it yield during the year? are there many consecutive weeks or months during which the yield is but small? are there suitable sites for reservoirs and dams? and, lastly, to what extent would the proposed works and abstraction of water interfere with existing interests? The difficulty of finding adequate and satisfactory gathering-grounds in the United Kingdom becomes more and more serious as suitable areas are taken up by one town after another. Mountainous or hilly gathering-grounds are, all other things being equal, to be preferred, because the rainfall is greater at high elevations, because the land is less suited for agricultural purposes, and because, even after allowing for the loss of head necessary to produce the flow through the conduit that extends from the reservoir to the town, the water can still be delivered into the service-reservoir at such an elevation as will supply the houses without pumping.

The engineer has also, in the United Kingdom, to allow for the water compensation to be given to the river fed by the gathering-ground. This compensation in the case of rivers in manufacturing districts is commonly fixed by parliament at one-third of the whole water to be obtained, leaving so much of the remaining two-thirds as the water authority or company cares to make use of for the purposes of supply; when the river passes through a mere rural district very much less compensation water, usually about one quarter of the whole amount available, is given. Whatever may be the quantity of the compensation water, it is always made a first (water) charge on the undertaking. This provision of storage and of compensation water is an advantage to the river, as by it heavy floods are prevented; and during those periods when for days or weeks together the natural flow of the river would be practically reduced to a mere rill, the compensation water affords a satisfactory and steady stream. Sometimes a separate reservoir is handed over to a committee of riparian proprietors, who regulate the outflow as they please. Sometimes the act prescribes that there shall be a continuous equable outflow day and night throughout the year; sometimes the compensation water must be given by an enlarged flow restricted to the working hours of working days; and sometimes the regular daily flow is reduced, so as to reserve water for periodical flushes of heavy delivery during the dry season. Experience has shown that periodical flushes during the dry season require to be very large in volume to be observable at a distance of a few miles down-stream below the point of discharge. Sometimes compensation, when arranged on the basis of one-third of the available rainfall, is given to a greater extent during the dry summer months and to a lesser extent during the wet winter months, in order to be of special benefit to riparian and mill owners, but this, however, is only practicable with relatively large storage. Bearing in mind the conjoined demands of the town and of the river, and knowing from rain-gauge observations the average rainfall on the gathering-ground, the engineer makes a deduction from this average to arrive at the proper average yield of three consecutive dry years, which is about 80 per cent. of the average rainfall for a considerable number of years; he next allows for loss by evaporation and absorption, which varies from about 13 to 17 inches of rainfall according to the nature and situation of the catchment area, and then treats the remainder as available for storage. Lastly, he has to ascertain the irregularity from month to month in the rainfall, and he is then in a position to say how many days' storage the reservoirs should contain; these numbers of days vary very largely according to the character of the rainfall of the district. Only under most favourable conditions for reservoir construction is it advisable to make the capacity of the reservoir greater than is needed to produce uniform flow for at the most three consecutive dry years. The total storage in different works varies from about 150 to about 180 times the ordinary daily draught from the works. The late Mr W. Pole, Secretary of the Institution of Civil Engineers, after thoroughly investigating forty-three years' rainfall, found that it would require a store of something like nine hundred days' supply to equalise the forty-three years' rainfall.

Dams.—Having ascertained the extent of the storage needed, the hope of the engineer is that he may find among the hills on the course of the stream from the gathering-ground some valley not too narrow and steep, and having a contraction at its lower end, across which may be built a dam which will pen up in the valley the needed quantity of water. In the United Kingdom these dams have commonly, until recent years, been made by earthen embankments having faces of a very gradual slope, at a suitable elevation, and containing in the centre a wall of puddled clay carried down below the ground surface into 'the puddle trench' sunk into the substratum until a solid water-tight bed is reached. Some of these banks have been made of great height, as much as 120 to 140 feet above the surface.

Most of the high dams constructed during recent years both in the United Kingdom and abroad have been masonry or concrete structures. The design of such dams requires careful and elaborate calculations in order to insure that the maximum compressive stresses on the material shall not exceed a predetermined limit, and that there shall be no tensile stresses anywhere in the structure. A safe rule is the following—if lines of resultant pressure, due to the weight of the structure and the water-pressure, are drawn for any vertical cross section of the dam, both for the dam empty and full, then these lines must intersect any horizontal plane of the section within the middle third of the length of that plane section. When the dam is empty the intersection will be at the up-stream edge, and when the dam is full at the down-stream edge, of this middle third. It is also essential to insure during the work of construction that no part of the structure shall be more impermeable to water than the water-face of the dam.

The first lofty masonry dam built in this country was that at Vyrnwy (q.v.) for the Liverpool Water Supply. This has a length of 1180 feet, a maximum height of 134 feet above foundation level, and provides for the impounding of about 12,000 million gallons. More recent masonry dams are those in the Elan Valley, Wales, for the Birmingham Water Supply, and those of the Derwent Valley scheme for supplying water to Leicester, Nottingham, and Sheffield. The Croton Dam for the New York supply has a length of 1500 feet; it rises to a height of 162 feet above the river-bed, and has a maximum height above foundation level of 260 feet. Generally such dams are straight in plan, but a number of smaller masonry dams have been built with horizontal curvature, the dam acting like an arch in sustaining the water-pressure. By artificially raising the level of an existing lake, as in the case of Loch Katrine for Glasgow, and Lake Thirlmere for Manchester, large storage capacity can be obtained without the necessity of building a lofty dam.

Overflow Weirs.—An essential feature in all dams is the overflow weir; in masonry dams a portion of the dam itself may be used for this purpose, but in the case of earthen dams it is an essentially

independent work, consisting of a masonry sill and a watercourse into which the overflow over this weir passes, and then finds its way back into the stream below the dam. The length of the weir must be such that the maximum flood discharge off the catchment area, when the dam is full, can be passed away as overflow over the waste weir without attaining to a greater depth than about 2 feet above the crest of the weir. Each foot length of the weir would discharge, with a head of 2 feet, about 8 c.f. of water per second, hence for a large catchment area about 40 feet length of waste weir is needed for each 1000 acres.

Charge for Water.—For trade purposes this is commonly done by meter. Meters may be divided into two great classes, the Inferential and the Positive. A typical inferential meter is one where the current of water in passing through the meter causes the rotation of a vane (like that of a smoke-jack), and experiment having shown what relation the revolutions of the vane bear to the quantity passed in that experiment, it is *inferred* that at all rates of delivery the revolutions and the quantity will vary together. There should not be any harmful loss of pressure in passing through such a meter. A typical instance of a positive meter is one wherein the water fills a vessel of known capacity, and is then automatically turned into a second vessel, which it fills while the first one is being discharged. Such a meter, when properly constructed, is indeed a positive meter, but it is obvious that the pressure with which the water is delivered is destroyed, and that thus such a meter could not be placed in the cellar, for example, with the intention that the water which it had measured should be sent to the top story of the house, or indeed to any higher point. Another kind of positive meter is one wherein a piston is caused by the water to traverse in a cylinder, and to change its direction of motion when the cylinder is full, thus recording cylinderfuls of water. In such a construction, or in the numerous modifications of it, the pressure is for all practical purposes preserved. There are also positive rotary meters.

It has been suggested that water for domestic purposes should be charged for according to the quantity actually consumed, and parliament in a number of cases has authorised this. On the Continent many towns have followed the example set by Berlin, which has gradually given an entire meter-supply; but in Berlin, owing to the flat system, there are on an average seventy occupants per house—i.e. per supply; while in London there are only on an average 7·39 per supply. In Berlin the landlord of the whole house is made liable for the water, there being one meter; thus only a tenth of the meters that would be required for an equivalent London population is needed. Further, the tenants, although they can draw as much water as they please, are very soon checked if they waste it, because the landlord has to pay for the whole, and he at once complains if the tenants' fittings are out of order or the water is otherwise wasted. On the other hand, many persons say that it is of such vital consequence to encourage the poor in habits of cleanliness that it is worth while to pay for water by means of a rate upon the value of the houses, although thereby the well-to-do man living in a fashionable neighbourhood pays a much larger amount per 1000 gallons than does the poor man. But it is no more illogical to charge by a percentage rate on annual value for bringing water to a house than it is to charge in that manner for the use of the sewers taking the water away.

Other plans of charging have been proposed or are in use, such as payment by a rate upon the value of the house plus the employment of a meter The rate payment on the value covers the supply of a certain number of thousands of gallons per quarter without further cost to the consumer; but should this number of gallons (which varies according to the annual value) be exceeded, then a 'quantity' charge is made for that which is used in excess. In some cases, where the municipality is the water authority, there is a rate upon the properties using the water plus a general rate upon all properties whether they use the water or not, it being held that warehouses and other properties—even if no water be consumed there—benefit by the water-supply as regards safety from fire. In other places there are charges for baths; and special charges on churches, public-houses, shops, new buildings, &c., are in operation in many counties and towns in Great Britain.

The London water supply was for half a century in the hands of eight companies. The Metropolis Water Act of 1902 constituted a Metropolitan Water Board to purchase and carry on the eight undertakings, which in 1904 passed to and vested in the Board. The Board consists of 66 members appointed by the County Councils and other authorities within the water area, the London County Council electing 14 of them. The supply is obtained from the Thames, the intakes being none of them lower than Hampton, from the river Lea or chalk wells in the Lea valley, and from chalk wells in Kent. The New River (q.v.) still as of old brings the waters of the Chadwell, Amwell, and other springs from Hertfordshire to London.

Sea-water may be rendered drinkable by being filtered through 15 feet of fresh dry sand; but at sea it must be distilled. The distilled water, however, has no air dissolved in it, and is unpalatable; and it has a nauseous odour and taste derived from the decomposition of organic matter in the sea-water. The addition of chemical reagents is objectionable; aeration of a large quantity of water is a slow process, and the air taken up may be of bad quality, as in the hold of a ship. In Dr Normandy's apparatus there is an evaporator in which sea-water is boiled by superheated steam in steam-pipes; the vapour is cooled down in a condenser. The cooling water in the condenser as it is itself warmed loses its dissolved air; this air is led round and mixed with the steam which is being condensed, and the condensate is fully aerated.

There is another system of water-supply now largely in use in London and Glasgow—viz. that of high-pressure water (at 700 lb. to the square inch) provided for the purposes of hydraulic lifts, and for other motors, in establishments needing for brief periods considerable motive-power.

The water-supply of great cities and towns is usually treated of in the articles on those towns. See also the articles AQUEDUCT, ASSUAN, BACTERIA, CANAL, CEYLON, FILTER, GERM, HYGIENE, INDIA, IRRIGATION, RAIN, RIVER, SEWAGE, TANSA.

Water-avens. See GEUM.

Water-beds, a valuable contrivance for the comfort of the sick, especially for lessening the risk of Bed-sores (q.v.), invented by Neil Arnott (q.v.). They are somewhat similar to Air-beds (q.v.), and have recently been to a large extent superseded by an improved form of the latter. The water-bed is laid on an ordinary bedstead, either upon or in place of the mattress, and filled with warm water to the proper degree; it must not be so full that it will not yield readily under the body of the patient. Clothes, pillows, &c., are then laid on it, as on a common bed, and the patient transferred to it.

Water-beetles, beetles which live on or in the water, especially the somewhat similar Amphizoideæ, Haliplidæ, Dyticidæ, and Gyrinidæ, and also the quite different clavicorn Hydrophilidæ. The Dyticus (or Dytiscus), common in stagnant water, is olive-green above, and oval in shape.

As the respiratory organs of the adult are not adapted to obtain air from the water; the beetle comes at intervals to the surface, where it tilts up its tail and collects air between the end of the

A, *Dyticus marginalis*, or Great Water-beetle; B, larva.

wing-covers and the end of the body. Into this air-filled chamber there open eight pairs of respiratory stigmata, the entrances to the tracheæ.

Water-blinks. See MONTIA.

Water-boatman. See BOAT-FLY.

Water-brash. See INDIGESTION.

Water-buck (*Cobus ellipsiprymnus*), one of the antelopes with horns restricted to the males, used to be common in South Africa, and is still found from the Limpopo northwards. It is fond of water, and is a strong swimmer.

Water-bugs, the popular name of a tribe of insects (Hydrocorisæ) in the order Rhynchota. They live almost entirely in water, and feed upon other aquatic insects. One of their most distinctive characteristics is the shortness of the antennæ which lie concealed in pits near the eyes. As representatives of the tribe may be noted the Water-boatman (Notonecta), whose long hinder-legs are thrown out like sculls, and the Water-scorpions (Nepa and Ranatra), with fore-legs adapted for seizing prey, and with a pair of terminal tail-like organs which form an air-tube.

Waterbury, a city of Connecticut, 23 miles SW. of Hartford, on the Naugatuck River. It has a fine central park, with the city hall and St John's Episcopal church (spire 200 feet) opposite, and is a busy manufacturing place. It is most important for its brass wares, but it is its cheap watches that have carried its name round the world. Pop. (1880) 17,806; (1920) 91,410.

Water Caltrop. See TRAPA.

Water Chestnut, the edible seed of *Trapa natans* (see TRAPA). The name is also given to the edible tubers of *Scirpus tuberosus* (see BULRUSH, CYPERACEÆ), which is cultivated by the Chinese in tanks very abundantly supplied with manure. It is destitute of leaves, except a slender short sheath or two at the base of each culm. It is stoloniferous, and the tubers are produced on the stolons. They are in high estimation as food and as medicine, and are eaten either raw or boiled.

Water-clock. See CLEPSYDRA.

Water-closet. See SEWERAGE.

Water-colours are pigments prepared for the use of artists and others by mixing colouring substances in the state of fine powder with a soluble gum such as gum-arabic. These are made up in the form of small cakes, which are rubbed down with water and applied with a brush to paper, ivory, and some other materials. Moist water-colours are made up with honey or glycerine as well as gum, and are prepared so as to be kept in small earthenware pans or metallic tubes. Dry cakes require to be rubbed down with water on a glazed earthenware palette or slab, but moist colours can be mixed with water for use by the friction of a brush, so that the japanned lid of the box which contains them serves for a palette. The latter are accordingly very convenient for sketching from nature. For painting walls, the pigments are usually mixed with common glue or size. The most important water-colour pigments are noticed under various heads which are given in the article PIGMENTS.

In water-colour painting two methods are employed; by one the artist works in transparent colours, by the other in opaque or body colours. In working by the latter method, which somewhat resembles oil-painting in its nature, Chinese white (see WHITE PIGMENTS) is mixed with light colours to give them body. Not only is there much artistic work done solely in transparent colours, but it is almost always these that are used for tinting mechanical drawings, maps, and the like. Some artists freely combine transparent, semi-transparent, and opaque colours, and others use the dry brush or knife for sponging or scraping out colours. The quick drying of the water-colour pigments is favourable to rapid execution; and greater clearness is attained than is practicable in oils. In water-colour painting the texture of the paper employed is often of importance. Water-colour drawings are of course more easily injured by damp than oil-paintings.

WATER-COLOUR PAINTING in the modern sense is especially an English art, though the use of colours mixed with water as opposed to oil is by no means new. In Chinese and Japanese painting the oil medium is hardly ever employed. In the illumination of mediæval missals water-colours were used mixed with the body white; and the same is true of the miniature-painting of the 18th century. Frescoes and painting in tempera were also in a sense works in water-colour. Further, Dürer and certain of the German, Flemish, and Dutch artists were accustomed to outline drawings with a reed pen, and fill in those outlines with an auxiliary flat wash. Gradually the hard lines were replaced by touches with the brush, and the result was a monochrome in browns and grays, bistre or Indian ink. These again came to be tinted, and so suggested the full use of colours. Rembrandt often drew in brown, and added dashes of strong colour; Rubens, too, anticipated the water-colour *drawing* of the 18th century, which was topographical in spirit and in treatment, and considered often merely as material for engraving purposes. The stained drawing gradually gave way to the more perfect tinted drawing or tinted monochrome of which Paul Sandby (1729–1809) and J. R. Cozens (1752–99?) were accomplished masters; the work of the former is luminous, that of the latter, contemplative. Other early names are those of Hearne, Dayes, Pars, Rooker. At the end of the 18th century, however, a double change took place. The primary interest of the picture became poetical or emotional, not topographical, and the methods of oil-painting were adopted (i.e. the brush was substituted for the pen or pencil, in the outlining or drawing, and local colours were applied direct instead of being washed in). It was Girtin, Cotman, and especially Turner, who revealed the immense scope and power of water-colour *painting*.

Thomas Girtin (1775–1802) attained great richness of tone and breadth with broad sweeping designs; his compositions are bold but simple, while those of J. S. Cotman (1782–1842) are limpid,

sensitive, and grasp the essential spirit of a scene. J. M. W. Turner (1775–1851) occupied with all the subtleties of atmosphere and light, chose water-colour as his favourite medium; a master of technique, his work is marked by fulness and warmth, as well as by grace and charm. The landscape tradition of water-colour was worthily upheld in the first half of the 19th century also by painters such as Francia, Bonington, Prout, Cox, de Wint, Varley, Copley Fielding, and to a certain extent by Constable; and in the second half of the century by Fred. Walker, Birket Foster, Sir J. Gilbert, Pinwell, McTaggart, but especially by H. B. Brabazon (1821–92) and Arthur Melville (1855–1904). Figure-painting, however, practised by Rowlandson and Blake (who both died in 1827) more as illustration, came to be developed to gorgeous lengths by D. G. Rossetti (1828–82) and Ford Madox Brown, while A. W. Hunt took up still life, and Whistler did some decorative work in water-colour. Of those working more particularly in the 20th century, the best known names are J. S. Sargent (1856–1926), Wilson Steer, A. W. Rich, Sir D. Y. Cameron, Sir G. Clausen, G. Houston, Frank Brangwyn, G. M. Gere, Romilly Fedden, Russell Flint, and D. Muirhead.

The Society of Painters in Water-colours was instituted in 1804, and held its first exhibition in 1805; the Scottish Society of Painters in Water-colour was instituted and held its first exhibition in 1878. Both societies were accorded the designation 'Royal,' the former in 1882 and the latter in 1888. Water-colour painting has in modern times been practised extensively in Italy, France, and other countries, but it has never attained the intimacy or the finality that characterises its development in Britain.

See PAINTING, p. 695; the separate articles on the principal water-colour painters; also Redgrave's Introduction to the Catalogue of Water-colours at South Kensington (1877), and his son's *Water-colour Painting in England* (1892); Hamerton, *Graphic Arts* (1882); Cosmo Monkhouse, *The Early English Water-colour Painters* (1889); Roget, *History of the 'Old Water-colour' Society* (1891); Finberg, *English Water-colour Painting* (1906); Cundall, *British Water-colour Painting* (1908); A. W. Rich, *Water-colour Painting* (1918); Finberg and Taylor, *British Landscape Painting in Water-colour* (1918).

Water-cress. See CRESS.

Water-deer, a small Chinese Musk-deer (q.v.) of aquatic habits; also, in Africa, one of the Chevrotains (q.v.).

Water-dropwort (*Œnanthe*, a genus of plants of the family Umbelliferæ; having ovato-cylindrical fruit, not prickly nor beaked, each carpel with five blunt convex ribs, and single vittæ in the interstices; the calyx teeth lanceolate; the petals obcordate and radiant, with an inflected point; the partial involucre of many rays; the flowers of the circumference on long stalks and sterile, those of the centre subsessile and fertile. A number of species are natives of Britain, large perennial plants, with a strong and generally disagreeable aromatic smell, and compound or decompound leaves. The Common Water-dropwort (*Œ. fistulosa*) and the Hemlock Water-dropwort, or Water Hemlock (*Œ. crocata*), are both common in wet places in Britain and throughout Europe and both are narcotic acrid poisons. The roots of the latter have some resemblance to small parsnips, and hence fatal accidents have frequently occurred. The Fine-leaved Water-dropwort, called Water-Fennel (Wasserfenchel) by the Germans (*Œ. Phellandrium*, formerly known as *Phellandrium aquaticum*), is also common in ditches and ponds both in Britain and on the Continent. It has a jointed root-stock (*rhizome*), with tufted whorled fibres, and a strong zig-zag stem dilated at the base. It is not so poisonous as the other species just named. It was at one time erroneously regarded as a specific against pulmonary consumption; but it has been advantageously employed in pulmonary complaints.

Hemlock Water-dropwort (*Œnanthe crocata*).

Watered Silk. See MOIRE.

Water-engine. See WATER.

Waterfalls occur most frequently in mountainous countries, where the streams from the mountain-sides enter the valleys. It is only when the side of the valley is composed of hard rock that there can be a waterfall; in friable strata the stream wears out a ravine or side-valley. These mountain waterfalls, however, are generally rather curious and picturesque than grand, the volume of water being in most cases comparatively insignificant, though the height of fall is occasionally very great. All mountain waterfalls necessarily change their aspect from season to season—in winter a roaring torrent plunging headlong into the abyss, in summer often a mere film of water trickling down the face of the precipice. Waterfalls in comparatively level districts are not nearly so common, and their height of fall is insignificant compared with that of mountain cataracts; but the much greater volume of water, and its steady and even flow to the head of the precipice over which, in solid column, it descends with a thundering plunge, place such waterfalls among the grandest of nature's phenomena. It is where the course of a large river passes from a higher to a lower plateau, and where the upper plateau is edged with rock, that the grander cataracts are formed. If the rocks are of the same hardness from top to bottom, the edge of the escarpment, supposing it to be perpendicular at first, becomes worn off, and a slope or *rapid* is formed. But when the upper edge is hard and the under strata soft and friable, the reverberation of the spray wears away the softer parts below, leaving a projecting ledge at the top, which breaks off, piece by piece, as it becomes too much undermined, so that the fall is constantly receding. For the utilisation of waterfalls to generate electrical energy, see TRANSMISSION OF POWER. The cataracts of the Velino and Anio, in Italy, are beautiful artificial imitations. The most important waterfalls are discussed under their own names or those of the rivers or districts to which they belong. Among them are:

Yosemite, California (3 plunges: 1430, 575, 320)	2325	feet.
Sutherland, New Zealand (3 plunges)	1904	"
Kalambo, Northern Rhodesia	1400	"
Gavarnie, Pyrenees	1385	"
Staubbach, Switzerland	980	"
Vettisfos, Norway	900	"
Kaieteur, British Guiana	741	"
Bridal Veil, Yosemite, California	625	"
Maletsungane, Mont-aux-Sources, Basutoland, over	600	"
Nevada, Yosemite, California	594	"
Sterling, New Zealand	505	"
Skjaeggedalsfos, Norway	500	"
Tequendama, Bogotá, Colombia	475	"

Voringfos, Norway	475	feet
Aughrabies, Orange River, South Africa	over 450	"
Yellowstone, Wyoming (2 plunges: 110, 310)	420	"
Rjukanfos, Norway	415	"
Victoria, Zambezi	400	"
Vernal, Yosemite, California	317	"
Grand, Labrador	316	"
Montmorenci, Quebec	265	"
Shoshone, Idaho	210	"
I-Guassu, Brazil	210	"
Foyers, Inverness-shire (2 plunges: 165, 40)	205	"
Niagara, North America	167	"

Of these falls, the most imposing as regards volume of water and width of precipice are the Victoria, Niagara, I-Guassu Falls, and the Yosemite Group.

Water-feather. See HOTTONIA.

Water-fennel. See WATER-DROPWORT.

Water-ferns, otherwise known as Hydropteridea, Rhizocarps, Pepperworts, or Heterosporous

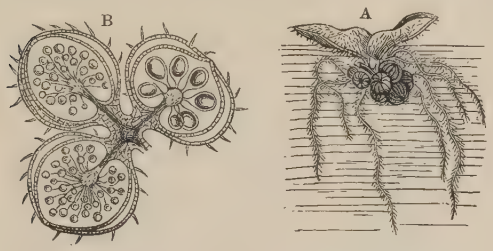


Fig. 1.

A, transverse section of the stem of *Salvinia natans*, showing aerial leaves and submerged leaf, with sporocarps. B, longitudinal section through three fertile teeth of a submerged leaf, one sporocarp with megasporangia, two with microsporangia. (After Goebel.)

Ferns, are called 'ferns' because, amongst other reasons, the development of the embryo is like that of true ferns, and 'heterosporous' because the sporophyte bears two kinds of spores instead of one. To understand these plants it is necessary

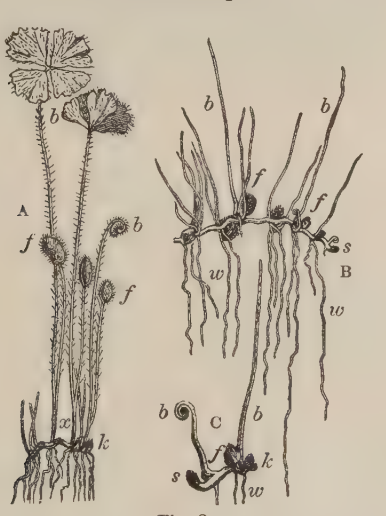


Fig. 2.

A. *Marsilia salvatrix*, anterior portion of stem with leaves; *k*, terminal bud; *b*, *b*, leaves; *f*, *f*, sporocarps springing from leaf-stalks at *x*. B, *Pilularia globulifera*; *s*, terminal bud of stem; *b*, *b*, leaves; *w*, roots; *f*, sporocarps. C, the extremity magnified; *k*, the lateral bud. (After Goebel.)

to know the structure of Ferns (q.v.). The order includes two families, the Salviniaceæ and the Marsiliaceæ. The former consists of two genera, Salvinia and Azolla; the latter also of two genera, Marsilia (see NARDOO) and Pilularia (Pillwort). The spore-bearing generation of Salvinia is a plant that floats on the surface of water. The stem bears on its upper side aerial leaves, and on its under side submerged leaves, which have the outward form and functions of roots; there are no true roots at all. The stem of Marsilia creeps along the surface of marshy land, or on the bottom below the water. The upper surface of the stem bears two rows of four-lobed leaves with long stalks; the under surface bears roots. Pilularia has peculiar narrow leaves. In Salvinia the sori or groups of sporangia are placed upon the aquatic leaves near the insertion, whence the name Rhizocarp. The coverings or indusia form small berry-like objects. In Marsilia the sori are borne upon fertile leaves which branch from infertile leaves just above their insertion. The fertile leaves are folded in like pea-pods, and each of them encloses several sori. The sori of Pilularia are similar, but globular. The sori of Salvinia and of Azolla are of two kinds. Some contain numerous long-stalked microsporangia with microspores; others contain fewer (in Azolla only one) short-stalked female megasporangia with megaspores. In Marsilia and Pilularia the megasporangia and microsporangia occur within the same sori. The microspores develop into rudimentary filamentous male prothallia. The antherozoids are formed in two cells at the apex of the filament, which represent the antheridium. The megaspores develop into female prothallia which never grow more than to project a little from the spores; they bear archegonia. The oosphere within an archegonium is fertilised by an antherozoid, and produces an embryo.

Water-finding. See DIVINING-ROD.

Water-flea, a popular name for minute aquatic Crustaceans such as Daphnia among Cladocera, Cypris among Ostracoda, and Cyclops among Copepoda. The common *Daphnia pulex*, abundant in fresh water, is a good representative. The body is enclosed in a bivalve shell; there is a large single eye; a pair of large antennæ are used as swimming organs. The Daphnids are marvellously prolific, and for prolonged periods parthenogenetic. There is an interesting difference between the winter eggs which require fertilisation and the summer eggs

Water-flea (*Daphnia similis*).

which do not. The females have a dorsal brood-chamber between the shell and the back. Of related genera Sida, Moina, Lynceus, Polyphemus, and Leptodora may be noted. In Cypris also the shell is bivalve; there are five pairs of appendages on the head and two on the body; most of these are used in swimming or creeping. Related to Cypris but living in the sea are Cythere, Halocypris, Cypridina, &c. Among Cyprids parthenogenesis again occurs, and in some species males have never been observed, while parthenogenetic development has been traced for as many as forty successive generations. The females bear large egg-sacs. In Cyclops the body is distinctly segmented, and there is no special shell; the head bears antennæ, mandibles, and maxillæ, and the first five segments of the thorax bear swimming appendages. Resembling Cyclops and also a fresh-water form

is Canthocamptus, while Cetochilus and Clausocalanus represent numerous marine Copepods. Water-fleas feed on microscopic plants and animals and on organic debris, while they themselves —often occurring in countless swarms—form an important part of the food-supply of certain fishes.

Waterford, an Irish county in the province of Munster, to the east of Cork. Its greatest length from east to west is 52 miles, and its breadth north to south 28; the total area being 721 sq. m., or 461,552 acres. The surface is in general mountainous, the principal ranges being Knockmeledown (2609 feet) and Cummeragh (2478). The Suir (q.v.) and the Blackwater (q.v.) are the chief rivers. The climate is moist, and the soil over a considerable part of the county is marshy; but the upland districts are well suited for tillage, and the lower pasture-lands produce excellent butter. In geological structure the mountains present the old and new slate, separated by red and gray quartz rock and quartzose slate. The valleys belong to the limestone series. Lead, iron, and copper are found, the latter having been worked at Knockmahon for many years. Marble of several colours is quarried near Cappoquin and Whitechurch, and potter's clay of good quality is found at Kildrum near Dungarvan. There are some cotton manufactures, and the fisheries are of some importance. The chief towns are Waterford, Dungarvan, Tramore, Portlaw, and Lismore. Before 1885 the county and the boroughs sent five members to parliament; in 1918–22 two; now (with East Tipperary) five members to the Dáil Eireann. Pop. (1841) 196,187; (1861) 134,252; (1881) 112,768; (1911) 83,966; (1926) 78,538. This district, in common with the adjoining county of Wexford, is believed to have been anciently peopled by a Belgic colony. The Danes also formed a settlement at the mouth of the Suir. From the date of the invasion Waterford became a stronghold of the English, large grants having been made by Henry II. to the De la Poers; and in all the alternations of the subsequent struggle with the Irish population it continued for the most part a firm centre of English influence. The county abounds with ecclesiastical and military antiquities of the Celtic and Danish as well as the Anglo-Norman period.

WATERFORD, the county town, but itself a county of a city and a municipal borough, is on the river Suir, at the head of the tidal estuary, Waterford Harbour, 97 miles SSW. of Dublin by rail. The city, with the exception of its suburb of Ferrybank, with which it is connected by a ferro-concrete bridge, lies on the right bank of the Suir, along which a handsome and spacious quay extends for a distance of nearly a mile, and from which the city ascends gradually in well-built streets. Vessels of 5000 tons or more with a draught of 22 feet can discharge their cargoes at the quay. The chief public buildings are the Protestant and Roman Catholic cathedrals, the Protestant episcopal palace, the Catholic college of St John, the city and county court-houses, besides hospitals, &c. The chief trade is with England in the export of butter, pork, bacon, corn, flour, eggs, and live-stock. Waterford is originally of Danish foundation, but in 1171 the city was taken by assault by Strongbow, by whom it was enlarged and made a place of strength. It received a charter from John, which was forfeited under James I., but restored by Charles I. in 1626. But few remains of its ancient buildings are now to be seen. Pop. (1881) 22,457; (1891) 21,693; (1901) on an extended area, 26,769; (1911) 27,464; (1926) 26,646 (nearly all Catholics).

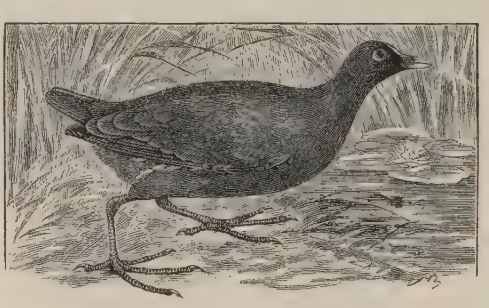
Waterford, LOUISA, MARCHIONESS OF (1818–91), was ranked by G. F. Watts as one of the greatest real artists of the time in virtue of her pictures ('Spring,' 'Christmas,' 'The Miracle of Healing the Two Blind Men') at Ford Castle, Northumberland, and her book-illustrations. She was the daughter of Lord Stuart de Rothesay, and widow of the third Marquis of Waterford. See A. J. C. Hare, *Two Noble Lives* (1893).

Water-gas. See GAS (LIGHTING BY).

Water-glass, or SOLUBLE GLASS. See BUILDING STONE (*Artificial Stone*), GLASS.

Water-hemlock. See HEMLOCK, WATER-DROPWORT.

Water-hen, or MOOR-HEN (*Gallinula chloropus*), one of the rails (Rallidæ), resident and widely distributed in Britain. It occurs throughout Europe, except in northern parts, and from North Africa to the Cape, from Ceylon and the Philippines to Japan and Lake Baikal in Siberia. It is represented by closely allied forms—*G. galatea* and *G. tenebrosa*—in America and Australia respectively. It lives by ponds and streams, makes its nest of matted reeds and sedges generally among the thick vegetation near the water's edge, begins to breed before the winter is well over, and produces two or even three broods in the season. The seven to nine eggs are buffish-white speckled with reddish-brown. There may be two or three broods in the year, and it is said that the young of the first brood will help to feed later nestlings. The food generally consists of slugs, worms, grass, grain, and insects, but the bird will also devour the young of other water-fowl. 'The call-note is loud and metallic, several times repeated.' The bird is about a foot long; the predominant colours



Water-hen (*Gallinula chloropus*).

are dark olive-brown and dark slate-gray, but there are white streaks on the flanks, and the under tail-coverts are white. See Howard Saunders, *Manual of British Birds*, and Coward's *Birds of the British Isles*.

Water-hog. See WART-HOG.

Water-horehound. See GYPSY-WORT.

Waterhouse, ALFRED (1830–1905), architect, was born at Liverpool, studied at Manchester, and became A.R.A. in 1878, R.A. in 1885, and a member of the Berlin Academy of Arts in 1890. Among his works are the Manchester town-hall and assize courts, Owens College, Girton College, the new Natural History Museum at South Kensington, several London clubs, the new St Paul's Schools, besides mansions throughout the country.

Water in the Head. See HYDROCEPHALUS.

Waterland, DANIEL, divine, was born at Waseley rectory in Lincolnshire, February 14, 1683. He studied at Magdalen College, Cambridge, became fellow in 1704, and by 1727 canon of Windsor, in 1730 archdeacon of Middlesex and vicar of Twickenham. Waterland was a scholarly and powerful controversialist, and defended the faith with great vigour against Samuel Clarke and Daniel Whitby, against Arians, semi-Arians, deists,

and latitudinarians of every school and type. He died 23rd December 1740.

His best books are the two *Vindications* of Christ's divinity (1719–23), and the *Further Defence* (1725), *A Critical History of the Athanasian Creed* (1724), *A Review of the Doctrine of the Eucharist* (1737), and *Scripture Vindicated* (1734), in answer to Tindal. There is a complete edition of his works, with Memoir, by Bishop Van Mildert (Oxford, 11 vols. 1823–28).

Water-lily, a name commonly given to the different species of Nymphæa and Nuphar, and also of Nelumbium, all genera of the family Nymphæaceæ (q.v.), and indeed often extended to all the plants of that family. Britain produces three species—*Nymphæa alba*, the White Water-lily; and *Nuphar luteum* and *Nuphar minimum* (or *pumilum*), called Yellow Water-lilies. The two former are frequent in still waters

White Water-lily (*Nymphæa alba*).

in most parts of the island; *Nuphar minimum* is more rare, and chiefly found in Scotland. All have heart-shaped leaves, floating on the water. The beautiful and fragrant white flowers of *Nymphæa alba* float during the day, but collapse and droop upon or sink below the surface during the night, rising and expanding again in the morning. The flowers of the yellow water-lily are raised by their stalks a little above it. The seeds of these, as well as of the Water-lily of the Nile (*Nymphæa Lotus;* see LOTUS), are farinaceous, and are sometimes used for food. The root-stocks of *Nymphæa alba* contain a large amount of gallic acid, and have been used in dyeing. Numerous species of tropical and subtropical Nymphæa are cultivated in British aquaria for their beautiful and fragrant flowers. The Sweet-scented Water-lily of North America (*Nymphæa odorata*) has a large white flower of great beauty, and of very sweet smell. *N. Lotus* is a sacred plant to the Hindus. *N. stellata* was held sacred by the ancient Egyptians.

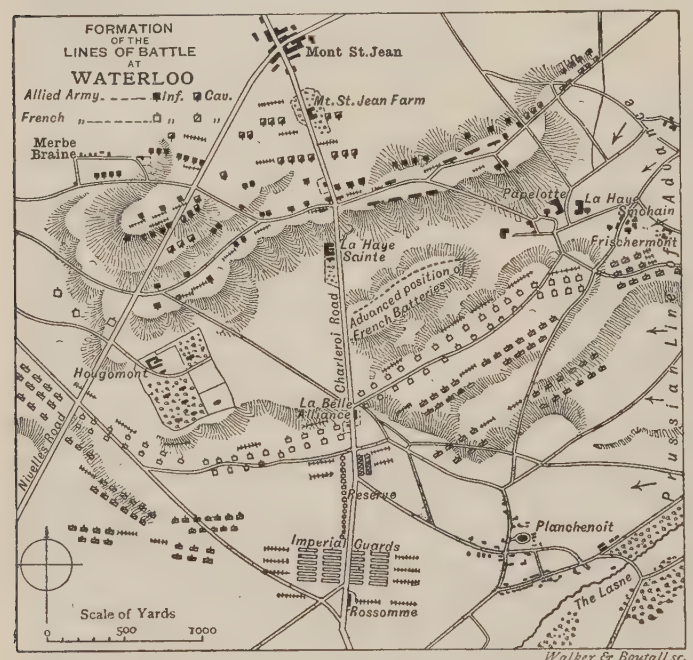
Waterloo, a village or small town, 11 miles S. of Brussels, which has given its name to the decisive battle fought near it on Sunday, 18th June 1815. On that day Wellington had collected 50,000 infantry, 12,400 cavalry, and 156 guns on the low ridge, some 3 miles long, which bestrides the Charleroi road near Mont St Jean. Of these troops only one-third were British, and many raw recruits; of the others a large proportion being Dutch-Belgians were disaffected and sympathised with the French. Along the main ridge, which was not entrenched, twenty battalions, some 15,000 men, were deployed in front line, and twenty battalions stood in second line under cover of its reverse slope. Some 14,000 men were in reserve in two groups, and 6000 in advance occupying the important posts of Hougomont (1200), La Haye Sainte, Papelotte, La Haye, and Smohain. The cavalry brigades were posted on the left flank and behind the centre and right, two at each place; 4000 horsemen being held in reserve. One-third of the guns were in action in front of the deployed line, one-third in support behind the right and centre, and the remainder in reserve. The right was strong so long as Hougomont held out; the left was weak in comparison, but the Prussians were approaching that flank from Wavre. On the right of the ridge was a steep ravine, whilst its left merged into a plateau. The front slope was gentle, continuous, and unobstructed, except by the farm enclosures, rising to an opposite ridge of the same character on which was deployed the French army, some 61,000 of all arms, under Napoleon. Its disposition was as follows: in front were 31,000 infantry, in two lines of battalion columns at deploying intervals. On each flank was a brigade of cavalry (1700 sabres); close in rear of the centre a reserve of the three arms, 10,000 strong; and behind it the main reserve, 11,000 strong, composed of the Imperial Guard. Two large bodies of cavalry, each about 2600 sabres, were also posted behind the main infantry line. Of the 246 guns 84 were pushed down the slope in front of the infantry, 96 were held in reserve, and the remainder formed local reserves with the cavalry behind the right and left centre.

The quality of the French troops was excellent; there were none that had not already made one or more campaigns, they were all of the same nation, and commanded by one in whose genius they had unbounded confidence. The opening of the campaign, too, seemed to justify their confidence. Two days before, under his command, they had defeated the Prussians at Ligny, and seen Wellington retire from Quatre Bras. Now 33,000 men and 96 guns, under Grouchy, were pressing the former, who, having no magazines west of Namur, might be expected to retire eastward on that place; while the latter, fearful for his communications westward, through Ghent to Ostend, offered battle with troops about equal in numbers but infinitely inferior to those of France.

The heavy rain that had been falling for many hours ceased at 4 A.M. on the 18th, but Napoleon did not attack until 11.30, owing, as he asserts, to the statement of his artillery officers that guns could not move until the ground had dried a little—a very inadequate reason for such a fatal loss of time. He occupied the interval with an ostentatious review of his army. The battle commenced with a violent cannonade all along the line. Then three divisions of Reille's infantry, on the west of the Charleroi road, preceded by clouds of skirmishers, attacked the homestead of Hougomont, and after a severe struggle gained the road south of the château, but were brought to a standstill by the loopholed garden-wall. The orchard east of the garden was temporarily occupied, but attempts to get into the farm-buildings failed, and reinforcements from the British right then drove them beyond the southern garden-wall with heavy loss. The struggle was constantly renewed throughout the day, but the defenders held the farm and out-buildings to the last.

Meanwhile the guns on both sides kept up a continuous fire, and to prepare for an attack against the British centre Napoleon advanced seventy-four to a lower ridge only some 600 yards from it. The movement was delayed owing to the presence of troops to the eastward being signalled, and cavalry were sent to ascertain who they were. But at 1.30 the French infantry on the east of the Charleroi

road advanced in dense columns flanked by cavalry —in all about 25,000 men, chiefly from D'Erlon's corps. The flank brigades first came into contact, and at 2 o'clock the British were expelled from the orchard of La Haye Sainte, but not from the buildings, while an indecisive action raged at Papelotte and Smohain. Simultaneously a charge of French cuirassiers swept down parallel to and west of the Charleroi road, scattered some Hanoverian troops, and passed between the hastily formed British squares, within which the gunners of the advanced batteries took refuge. A Belgian brigade taking to flight left Picton's weak division to withstand, unsupported, the attack of the heavy French columns. The moment was critical, as no infantry reserves were at hand, and the two brigades of heavy cavalry were therefore ordered to charge. One, the Household brigade, overthrew the French



Note.—The Village of Waterloo is about a mile north of Mont St Jean.

cuirassiers, cleared the space in rear of La Haye, and pursued to the west of the Charleroi road for some distance; the other, Ponsonby's, attacked the French infantry columns, and drove them back in disorder. Sweeping onwards, these three regiments reached the advanced French batteries, but were then taken in flank by French cavalry, and retreated with great loss under cover of the charge of their own light cavalry from the left wing. It was now nearly 4 o'clock, and determined but unsuccessful efforts had been unceasingly made by the French to gain possession of Hougomont and La Haye. Between that hour and 6 P.M. four great cavalry attacks were then delivered against the British right centre. Some 4400 horsemen rode in the first, and nearly twice that number in the third. The British squares stood firm against these attacks, but suffered great loss from the enemy's artillery and skirmishers whilst in this dense formation.

These impetuous onslaughts were, however, the desperate efforts of a commander who felt that he must sweep away the enemy in his front or perish, for at 4.30 part of Bülow's corps of Blücher's army appeared upon the field, and by six o'clock 29,000 men and 64 guns were pushing forward against the French right and rear. Blücher, with a loyal disregard to the possible disaster that might result to himself from such a course, had readily agreed to support Wellington with his whole army instead of retiring towards his base. His leading troops were indeed within 8 miles of Wellington's left at the time when Napoleon assumed them to be retiring before Grouchy towards Namur. The country separating the allies was little suited to the rapid march of large bodies of men. The deep and miry cross-roads had become almost impassable owing to the heavy rain. The men had been drenched and tired out on the 17th. A fire in Wavre hindered their passage through that town, and defective arrangements, causing two columns to cross on their march, still further delayed the general advance. A start could not be made until 7 A.M., and the rate of marching did not exceed 1 mile an hour. Grouchy, too, having ascertained the true direction of their march, was now pressing on their rear, and had to be held back. The rain, which Napoleon says prevented him attacking in the early morning, was therefore also responsible for many of the long hours during which Wellington had to bear unaided the full brunt of his attacks, and, but for Blücher's dogged resolution and his influence upon his men, might have prevented altogether that junction of the allies which they had designed on the night of the 17th, and to achieve which Wellington stood fast at Mont St Jean.

The Prussian corps advanced on a wide front, their left being directed on Planchenoit. To oppose them Napoleon (when assured of their approach by the capture of an orderly carrying despatches from Bülow at 1 P.M.) had detached 10,000 of the Young Guard under Lobau, as well as the cavalry (2400 sabres) already reconnoitring in that direction. He also wrote to Grouchy hoping that he was near enough to take Bülow in flank, but that officer was thoroughly committed to a severe action at Wavre, where Napoleon's letter reached him at 6 or 7 P.M.

Trusting that he could thus hold Bülow in check, Napoleon then continued his efforts against the British, whose front line had been somewhat altered by bringing forward two batteries and two brigades from the reserve. The latter deployed in a four-deep line extending from the north-east corner of the Hougomont enclosure to the main ridge. Soon after 6 P.M. Ney was entrusted with a fourth attack upon La Haye Sainte, and succeeded in gaining possession of the farm-buildings. At the same time and up to 7.30 the attack was pressed near the Charleroi road. Clouds of skirmishers and artillery fire repeatedly caused the allied battalions to deploy and advance down the ridge, when masses of French cavalry suddenly attacked and obliged them to form squares and so present vulnerable targets to the guns and sharpshooters.

But severe fighting was now going on for the possession of Planchenoit, and over 50,000 Prussians were engaged. At 7.30 Napoleon determined on one more attempt to crush the adversary in his front. The Imperial Guard advanced in two columns between Hougomont and La Haye Sainte.

That on the right, consisting of four battalions, moved first, and, unchecked by artillery fire, gained the summit of the ridge. The British Guards, who were there lying down in a line four-deep, sprang to their feet at Wellington's command, fired a volley and charged. Shattered by this enveloping fire, the heavy French column fell back in confusion. Ten minutes later the left column, six battalions, followed from the south-east corner of Hougomont against the same part of the British line. Adam's light brigade, on the right of the Guards, thereupon wheeled forward its right one-eighth of a circle, fired into their flanks and then charged. The Guards crushed with their fire the head of the column, and its rout was complete. A general advance of the whole British line then took place, and the battle was won.

In the meantime the Prussians drove the French in confusion from Papelotte, which they had won, on La Belle Alliance, thus exposing Lobau's left. His troops, assailed at the same time in front, then gave way, and after an obstinate resistance Planchenoit was wrested from them. This success laid open the main line of retreat to the fire of the Prussian guns, which now almost crossed the British front and turned the defeat into the most disastrous rout of a great army which history records. The allied cavalry pressed on in their eagerness so hastily as to exchange sabre cuts in the coming darkness. The losses were great in proportion to the numbers engaged: allies, 22,500, of whom 7000 were Prussians; and French (including prisoners), 32,000. The result was the deposition of Napoleon and his exile to St Helena.

See *The Campaign of Waterloo*, by J. C. Ropes (1893); Colonel Chesney's *Waterloo Lectures* (1861); Houssaye's masterly work on *Waterloo* (trans. from the 31st French edition in 1900); O'Connor Morris's *Campaign of 1815* (1900); Holland Rose's *Napoleonic Studies* (1905); as well as the works of Charras, Thiers, Brialmont, Siborne, Shaw-Kennedy, Gurwood, Dorsey Gardner, Hooper, Belloc, and the literature cited under NAPOLEON. The French named the battle from Mont St Jean, and the Prussians from Belle Alliance; but the name Waterloo is now also commonly used in France and Germany as well as in Britain. The mound surmounted by the Belgian lion is conspicuous on the field.

Waterloo, capital of Black Hawk county, Iowa, on both sides of the Cedar River, 93 miles by rail W. of Dubuque, with mills, cooper shops, automobile and other factories. Pop. 36,000.

Waterloo-with-Seaforth, a watering-place and urban district of Lancashire, on the Irish Sea, adjoining Bootle (q.v.). Pop. (1891) 17,225; (1901) 23,102; (1911) 26,396; (1921) 29,626.

Water-marks. See PAPER, BOOK.

Water-mouse. See HYDROMYS.

Water Ousel. See DIPPER.

Water-plantain. See ALISMACEÆ.

Water-power. See WATER.

Waterproof. See INDIA-RUBBER.

Water-rail. See RAIL.

Water-rat. See VOLE, MUSK-RAT.

Water-soldier (*Stratiotes aloides*), a floating plant belonging to the family Hydrocharidaceæ, is common in lakes and ditches in the east of England. It is a singular plant with numerous leaves, which are strap-shaped and spring from the root, from which also springs the two-edged flower-stem, bearing the spathe with beautiful and delicate white flowers. In autumn the whole plant disappears, the root alone remaining at the bottom of the water, from which a number of young plants arise in spring, filling up ditches, so that nothing else can grow in them. The water-soldier is a very ornamental aquatic plant.

Water-soldier (*Stratiotes aloides*).

Water-spaniel. See SPANIEL.

Waterspout. See STORMS.

Water-supply. See WATER.

Water-tight Compartments. See BULKHEADS, SHIPBUILDING.

Waterton, CHARLES, naturalist, born at Walton Hall near Wakefield, 12th June 1782. Of Catholic parentage, he was educated at Stonyhurst, and, devoting himself to researches in natural history, spent much time in 1812–24 in America, publishing on his return his most interesting and successful *Wanderings in South America* (1825; 6th ed. 1866; and often since re-edited by J. G. Wood and others). His *Natural History Essays* appeared in three series, 1838–57; and a new ed., with Life of the author by Moore, was issued in 1879. Waterton, who was rather a keen observer and racy writer than a man of science of the new school, died 27th May 1865.

Watertown, (1) a town of Massachusetts, on the Charles River, 8 miles W. of Boston, with a national arsenal and manufactories of stoves, woollens, starch, stockings, and cardigan jackets; pop. 21,500.—(2) Capital of Jefferson county, New York, on Black River, 12 miles by rail E. of Sackett's Harbour on Lake Ontario. The rapids supply power for numerous factories turning out wagons, machinery, farming implements, flour, paper, woollens, &c. Pop. (1920) 31,285.—(3) A city of Wisconsin on both sides of Rock River, 44 miles by rail W. by N. of Milwaukee, with manufactories of flour, &c. Here is the Northwestern University (Lutheran; 1864). Pop. 9000.

Waterville, a city of Maine, on the Kennebec (navigable to this point by a dam and locks at Augusta), at Ticonic Falls (18 feet), 19 miles by rail N. by E. of Augusta. It contains several mills and factories, and is the seat of Colby University (Baptist; 1820). Pop. 13,000.

Water-violet, a genus (Hottonia) of Primulaceæ, so called from the likeness of its flower to the stock-gillyflower, once known as violet. There are two species—*H. palustris* in central and northern (not Arctic) Europe, and *H. inflata* in America (Maine to Florida coasts and along the Mississippi).

Watervliet, a city of Albany county, New York, on the river Hudson opposite Troy, and 6 miles N. of Albany. It has a federal arsenal, and there are important carriage works, foundries, woollen and paper mills, &c. Formerly West Troy was the official post-office designation. Pop. 16,000.

Waterways. See CANAL, RIVER.

Watford, a borough (since 1922) of Hertfordshire, on the Colne, 15 miles (by rail 18) NW. of London. The Perpendicular church, restored in

1871, contains some interesting monuments of the Morrisons and of the Capells, Earls of Essex, whose seat (till 1922), Cassiobury, is close to the town; and there are also the London Orphan Asylum (inst. 1813; transferred hither, 1871), the Salters' Company's almshouses (1873), the endowed schools (1874), the public library and school of art (1874), &c., besides manufactures of silk and paper. Pop. 46,000.

Watkin, Sir Edward William, was born at Salford in 1819, and was employed in his father's counting-house till 1845, when he became secretary to the Trent Valley Railway; and from that time onward he was known as director or manager of several of the most important railways, especially of the South-Eastern. In 1861 he undertook a mission to Canada in connection with the union of the Canadian colonies, and was returned to parliament in 1864, his long parliamentary career being most closely associated with Hythe. He did much to help in securing parks for the people, especially in Manchester, and was made a baronet in 1880. He was a strenuous promoter of the Channel Tunnel. Another undertaking of his was the (unfinished) Wembly Park Tower, designed to exceed the Eiffel Tower (q.v.) in height. In 1889 he acquired by purchase part of Snowdon. He died 13th April 1901.

Watling's Island, one of the Bahamas (q.v.), the probable landfall of Columbus.

Watling Street, one of the great Roman highways of Britain, commencing at Dover, passes through Canterbury and Rochester to London, and thence to St Albans, Dunstable, Towcester, High Cross, Wall, Wroxeter, and Chester. From Chester one stretch goes to Warrington, Wigan, and Lancaster; another to Manchester, Ribchester, and Carlisle; while Ilkley and York are connected with both Manchester and Ribchester. The name of Watling Street, however, is further given to the road (really part of Ermine Street) from York to Catterick, Corbridge (at Hadrian's Wall), High Rochester, Melrose to the east end of the Wall of Antoninus (q.v.), the northern part being known as Dere Street; and also to the shorter roads from London to Chicester, from Wroxeter to Abergavenny, from Chester to Carnarvon. The name (which has never been satisfactorily explained) is almost certainly of early Saxon origin, while even the main section of the road (from London to Chester) must not be regarded now as absolutely Roman throughout its entire course. Traces, however, of the ancient road are still to be found in many parts, and in some it is still an important highway; a street in the city division of London retains its name. It was the line of division in the treaty between Alfred and Guthrum the Dane, and it is still the boundary between Warwickshire and Leicestershire, and between many townships and parishes. Perhaps a trace also survives in the name Wattlesborough, a place on Watling Street near Wroxeter (*Uriconium* or *Viriconium*). See Roads; also Codrington, *Roman Roads in Britain* (1903; new ed. 1918).

Watson, Richard, divine (1737–1816), was born at Heversham in Westmorland. He was educated at Trinity College, Cambridge, and was elected fellow (1760), professor of Chemistry (1764), and regius professor of Divinity (1771). He became archdeacon of Ely, and in 1782 bishop of Llandaff, retaining two rectories, but visited his diocese but rarely. A Liberal in politics and theology, he published, besides sermons, essays, and charges, an *Apology for Christianity* in answer to Gibbon (1776), and an *Apology for the Bible* (1796) in reply to Paine. See his egotistic autobiography (1817).

Watson, Thomas (*c.* 1557–92), a writer of artificial love poetry, was a Londoner who studied at Oxford. He wrote Latin poems and Englished Italian madrigals, but is best known for his *Hecatompathia* (1582) and *Tears of Fancy* (1593).

Watson, Sir William, poet, born 2d August 1858, son of a Wharfedale farmer, published *The Prince's Quest* (1880) and *Epigrams of Art, Life, and Nature* (1884), but first attracted notice by *Wordsworth's Grave* (1890), which was followed by *Excursions in Criticism* (a volume of essays; 1893), *The Eloping Angels* (1893), *Odes and other Poems* (1894), *The Father of the Forest* (1895), *The Purple East* (sonnets on the Armenian atrocities; 1896), *The Hope of the World* (1897), *For England* (1903), *Sable and Purple* (1910), *The Heralds of the Dawn* (1912), *The Man Who Saw* (1917), *The Superhuman Antagonists* (1919), *Poems Brief and New* (1925). *Collected Poems* appeared in 1898, 1906, and a selection, *A Hundred Poems*, in 1922. His poetry, dignified but passionate, is imbued with strong national feeling, and is marked by careful workmanship. He was knighted in 1917.

Watson Gordon. See Gordon (Sir John Watson).

Watt, the electrical unit of activity, is measured by the product of the voltage of the source into the current supplied. Thus a dynamo which is yielding 30 amperes at a voltage of 100 is working with an activity of 3000 watts. The watt is equal to 10^7 ergs per second, $=0{\cdot}735$ foot-pound per second, $=0{\cdot}00134$ British horse-power; so that one British horse-power $=746$ watts, nearly. It is customary to use the kilowatt as the practical unit. It is equal to a thousand watts or $1{\cdot}34$ horse-power. See Electricity, Volt.

Watt, James, improver, and almost inventor, of the modern steam-engine, was born at Greenock in Scotland on the 19th of January 1736. His father, a general merchant at Greenock, was long a member of the council of that burgh, and for a time a magistrate. His mother, Agnes Muirhead, was a woman of superior endowments. Two members of James Watt's family—his grandfather and an uncle—possessed some local reputation for scientific or engineering ability. The former was a teacher of mathematics, surveying, and navigation at Crawfordsdyke near Greenock; the latter was a land-surveyor and engineer. James Watt was very weakly as a child, and, being unable to go to school with regularity, he became to a great extent his own instructor. His mother taught him reading, and his father writing and arithmetic. He early manifested a turn for mathematics and calculations, and a great interest in machines, and accordingly—his father's business, for which he had been destined, having greatly declined—he came to Glasgow in June 1754 to learn the trade of a mathematical instrument maker. After a year in Glasgow he went to London, but ill-health compelled him to return home about a year after; he had however made good use of his opportunities, and after his return he set up as a mathematical instrument maker in Glasgow. The incorporation of hammermen of that city put difficulties in his way; but the authorities of the university took him by the hand, appointed him mathematical instrument maker to the university, and gave him the use of premises within their precincts. He lived there from 1757 to 1763, and retained his workshop there till 1773. In 1767 he was employed to make the surveys and prepare the estimates for a canal projected to unite the Forth and the Clyde. He made surveys for various canals, for the improvement of the harbours of Ayr, Port-Glasgow, and Greenock, and for the deepening of the Forth, the Clyde, and other rivers. He was also employed

on a survey for the Caledonian Canal (q.v.). In this and in other surveys, the accuracy of which was borne witness to by Telford, he made use of a new micrometer, and a machine, also of his own invention, for drawing in perspective.

As early as 1759 Watt's attention had been directed to the capabilities of steam as a motive-force by Mr Robison (q.v.), afterwards professor of Natural Philosophy in the university of Edinburgh, who was then a student in Glasgow. In 1761–62 Watt made a series of experiments on the force of steam, using a Papin's Digester (q.v.); but it was not till the winter of 1763–64 that he began the investigations which ended in his improvement of the steam-engine. A working model of the Newcomen engine, kept for the use of the natural philosophy class in the college, was sent to him to be put in repair. He quickly found out what was wrong with the model, and easily put it into order; but in doing this he became greatly impressed with the defects of the machine, and with the importance of getting rid of them. The result was that he hit upon the expedient of the separate condenser, which prevented the loss of steam in the cylinder. See STEAM-ENGINE, where his other important inventions, the use of the 'air-pump,' steam-jacket for cylinder, double-acting engine, &c., are described.

Watt, soon after perfecting his model, formed a partnership with Dr Roebuck, then of the Carron Ironworks, for the construction of engines on a scale adapted to practical uses; and an engine was erected at Kinneil, near Borrowstounness. But Roebuck got into difficulties; and nothing further was done until, in 1774, Watt entered into a partnership with Matthew Boulton (q.v.) of Soho near Birmingham, when, Roebuck's interest having been repurchased, the manufacture of the new engine was commenced at the Soho Ironworks. A patent for his invention had been taken by Watt in 1769, and a prolongation of his patent for twenty-five years was secured in 1775. This partnership was a fortunate one for Watt—Boulton was bold and enterprising; Watt was timid and shrank from the commercial side of affairs. The advantages of the new engine were in no long time found out by the proprietors of mines; and it soon superseded Newcomen's machine as a pumping-engine. Watt afterwards made numerous improvements in its construction, and in conjunction with his partner Boulton he immensely improved the quality of the workmanship employed in building engines and other machines. Between 1781 and 1785 he obtained patents for a series of inventions—among them the sun and planet motion, the expansion principle, the double engine, the parallel motion, and a smokeless furnace. The application to the steam-engine of the governor was Watt's crowning improvement. He described a steam-locomotive in one of his patents (1784), but did not prosecute it further, neither did he encourage his chief assistant Murdock (q.v.) in his experiments. He also invented a letter-copying press, machines for copying sculpture, and numerous devices unconnected with the steam-engine, several of which he patented. It is curious to recall that Boulton and Watt attempted to secure an act of parliament forbidding the use of high-pressure engines; Watt persisted in the use of steam at low pressure. Watt's claims to be the first discoverer of the composition of water were long and strenuously maintained (see WATER).

He retired from business in the year 1800, giving up to his two sons, James and Gregory, his interest in the extensive and prosperous business which Boulton had created at Soho. He showed the same alert and active mind after his retirement. The attic room at Heathfield Hall, his house near Birmingham, where he used to work alone, is still preserved, in its old condition. Here he was perfectly happy, working with his turning-lathe, and amongst his tools and models. In the earlier portion of his life he suffered much from ill-health. He had quickness of apprehension, a powerful memory, and an immense store of well-digested miscellaneous information outside his own domain. In conversation his utterance was slow and unimpassioned, with a quiet, grave humour, while his manners were gentle, modest, and unassuming. He died at Heathfield on 19th August 1819 in his eighty-fourth year. There are many monuments to Watt; the inscription on that in Westminster Abbey is from the pen of Lord Brougham. Watt stands in the front rank of inventors, and the honours paid to his memory and to himself in his later years appear to have been deserved by his personal qualities, no less than by the immeasurable benefits which his inventive talents have conferred upon the human race.

See J. P. Muirhead, *Origin and Progress of the Mechanical Inventions of James Watt* (3 vols. 1854), comprising a memoir, letters, and patent specifications; Muirhead's *Life*, abridged from his larger work (1 vol. 2d ed. 1859); Smiles, *Lives of Boulton and Watt;* Williamson, *Memorials of the Lineage of Watt* (1856); and Dr W. Jacks, *James Watt* (1901).

Watt, ROBERT, bibliographer and physician, was born the son of a small farmer near Stewarton in Ayrshire in May 1774, and studied for the church at Glasgow University (1793–97). He subsequently studied medicine at Edinburgh, and was licensed in surgery and pharmacy, which arts he practised in Paisley and in Glasgow (1799–1817). At his death (12th March 1819) he was a distinguished physician, accoucheur, and lecturer on the practice of medicine at Glasgow. He wrote medical works on diabetes, consumption, and hooping-cough, and a moral work, *Rules of Life;* but he is best known by his valuable (though far from complete or infallible) *Bibliotheca Britannica* (4 vols. 4to. 1824; see BIBLIOGRAPHY), which orginated in a catalogue (published 1812) of a library he gathered for the use of his students.

Watteau, ANTOINE, was born at Valenciennes in October 1684, and in 1702 he betook himself to Paris, where for some time he earned a livelihood by the sorriest hack-work for a picture-dealer. He subsequently received instruction from Gillot, and got employment with Audran, the decorator of the Luxembourg, and in 1712 was elected to the Academy, though he was actually admitted only in 1717. Fame and prosperity succeeded his former obscurity, but the contrast between the gaiety of his art and the melancholy of his life constantly overshadowed by ill-health is always apparent. In 1719 he visited England to consult Dr Richard Mead, then famous, for whom, during his stay, he painted one or two pictures. After his return home his health gradually declined; and on 18th July 1721 he died of consumption at Nogent, near Paris. His works can be divided into the illustrations of Italian comedy, the military scenes, and the pastorals (painted mostly after 1717). His art fits into the great Flemish tradition which culminated in Rubens, but here Rubens is refined of all grossness. Of a restless disposition, Watteau was prolific in his output (which included also a large number of drawings, furniture, decorations, &c.), while the misfortunes of his life helped him to create an imaginary dream-world of exquisite charm and colour. In some of his work he anticipates the division of tones and juxtaposition of colour of the Impressionists. A great collection of Watteaus was made by Frederick the Great, while there are important examples of his work in the Louvre and the Wallace Collection.

In 1734 de Julienne produced 3 vols. of engravings after Watteau, and in 1744 Gersaint published a *Catalogue raisonné*. The *Vie de Watteau* by Caylus (1748) was reprinted by the de Goncourts in *L'Art du 18me siècle* (1874), and a *Catalogue raisonné* was made by Ed. de Goncourt (1875). There are studies in English by Mollett (1883), Phillips (1895), S. Sitwell (1925); in German by Hannover (1889); in French by Dargenty (1891), Josz (1900), Séailles (1902), Mauclair (1905, Eng. trans. 1906; also 1921), Pilon (1912).

Wattle, a name given to many Australian species of Acacia (q.v.).

Wattle-bird (*Anthochæra carunculata*), a wattled Honey-eater (q.v.) of Australia, with wattles half an inch long. The plumage is variegated gray, brown, and white, and the flesh is delicious eating. In a Tasmanian species (*A. inauris*) the wattles are over an inch long.

Watt's Dyke. See OFFA'S DYKE.

Watts, ALARIC, was born in London, 16th March 1797, and died there, 5th April 1864. He had four years' schooling at Wye and Ashford in Kent; was an usher at Fulham and Runcorn, and a newspaper editor at Leeds and Manchester; married in 1821 the Quakeress, Priscilla Wiffen (1800–73), a sister of the two Spanish scholars; founded the *United Service Gazette* (1833); and made a great hit by his annual, the *Literary Souvenir* (1824–37). Latterly he was less successful, and in 1854 he was granted a pension of £100. He published two volumes of poetry, but one piece only by him is remembered—the alliterative *jeu d'esprit*, 'An Austrian army awfully arrayed,' &c. The Life by his son (2 vols. 1884) contains some interesting sketches of his contemporaries.

Watts, GEORGE FREDERICK, painter, was born in London, 23d February 1817, sent a picture to the Academy in 1837. He won prizes presented in 1842 and 1846 by the government for the decoration of the Houses of Parliament, with the cartoons 'Caractacus' and 'King Alfred.' At first he was largely self-taught, but during 1844–47 he studied in Italy, and formed his style after the Venetian school. Watts was remarkable for his individuality, dignity, extreme correctness in drawing, and good coloration. He painted many splendid portraits (not a few of them of the most eminent of his contemporaries) and some fine landscapes; his historical subjects are in the grand dramatic manner, but he is best known by his long series of pictorial moralities and allegories, 'Fata Morgana' (1848), 'Life's Illusions' (1849), 'Love and Death' (1877), 'Watchman, what of the Night?' (1880), 'Hope' (1886), 'Sic Transit' (1892), 'Love Triumphant' (1898), &c. Here the artist becomes didactic, but noble ideas are too often expressed in terms that are merely grandiose. Watts also produced some admirable sculpture, including the famous 'Physical Energy.' He was awarded the O.M. in 1902, and died on the 1st July 1904. In 1894 (when he declined a baronetcy) he sent 150 portraits (including Carlyle, Browning, M. Arnold, Tennyson) to the National Portrait Gallery. Some 100 more remain at his house of Limnerslease, now a gallery of his works, and there is a good collection in the Tate Gallery. There are works on him by Macmillan (1904), G. K. Chesterton (1904), Mrs Russell Barrington (1905), his widow (3 vols. 1912), E. H. Short (1925).

Watts, HENRY (1815–84), born in London, became demonstrator at University College, librarian to the Chemical Society, and editor of the Chemical Society's *Journal*, translated Gmelin's *Handbook of Chemistry* and other chemical works, but is best known by his *Dictionary of Chemistry* (based on Ure's; 5 vols. 1863–68; new ed. by Morley and Muir, 4 vols. 1889–94).

Watts, ISAAC, born on July 17, 1674, at Southampton, where his father kept a boarding-school, studied at a London academy. In 1696 he became tutor in the family of Sir John Hartopp at Stoke-Newington, and there he remained six years, acting also as assistant to Dr Chauncy, minister of the Independent Church in Mark Lane, whom he succeeded in 1702. His health was throughout infirm; and in 1712 he was prostrated by an illness so violent that he never thoroughly recovered from its effects. A visit which he paid to Sir Thomas Abney at Theobalds for change of air resulted in his domestication in the establishment till his death, thirty-six years afterwards, on November 25, 1748. As his health permitted he continued to preach and to write. Though hardly over 5 feet high, and feeble physically, he was counted among the best preachers of his time, and his sermons by no means belie this reputation. His theology was marked by a large charity and catholic spirit then uncommon amongst Dissenters. The degree of D.D. was given him by Edinburgh in 1728. His theological works were numerous, but are now quite forgotten. His treatise on *Logic*, long since superseded, was once a text-book at Oxford. But this childless saint and scholar assured the perpetuity of his name by his *Divine and Moral Songs for Children* (1715), which, in spite of many a metrical defect and much hopeless prose, show strength, sanity, and the right simplicity without weakness. And in Dr Johnson's words, 'a voluntary descent from the dignity of science is perhaps the hardest lesson that humility can teach.' His *Horæ Lyricæ* (1705), *Hymns and Spiritual Songs* (1707–9), and *Psalms of David Imitated* (1719) contain about 500 hymns and versions, of which many remain amongst the cherished treasures of English devotion. It is enough to name but these: 'There is a land of pure delight,' 'Jesus shall reign where'er the sun,' 'When I survey the wondrous cross,' and 'O God, our help in ages past.' There are Lives by Dr Gibbons, Dr Johnson, Southey, Milner (1834), and E. P. Hood (1875). See also T. Wright, *Isaac Watts and Contemporary Hymn-writers* (1914).

Watts-Dunton, THEODORE (the name Dunton, his mother's, he assumed in 1896), poet, critic, and novelist, was born in 1832 at St Ives in Huntingdonshire. His father was a solicitor and a naturalist, intimately connected with Murchison, Lyell, and other geologists, a pre-Darwinian evolutionist of considerable mark in the scientific world of London, and the Gilbert White of the Ouse valley. He himself received at Cambridge a somewhat elaborate private education, comprising music, art, and science, especially biology. Settling in London, he soon became the centre of a very remarkable literary and artistic company. At 'The Pines,' Putney Hill, he was Swinburne's house-mate for thirty years, and devoted himself to him as a sort of guardian in practical affairs, and a fosterer of his genius till his death. Of other friends more or less intimate—and it is as a friend of men of letters perhaps more than as a writer that Watts-Dunton is remembered—Borrow, Francis Hindes Groome, the Rossettis, William Morris, Tennyson, and others, reminiscences may be read in his *Old Familiar Faces* (1915). Exercising a most important influence on the art and culture of the day, he wrote enough to fill many volumes—in the *Examiner*, the *Athenæum* (1876–98), the *Nineteenth Century*, the *Fortnightly Review*, &c. His essays, always dealing with first principles, ceased to be really anonymous, but were not collected in his lifetime. He was hardly known to the general public, except for the sonnets and other poems that found their way into anthologies, and for the half-dozen articles on poetic subjects

that he contributed to the *Encyclopædia Britannica* and the present work. His prose essays—literary mainly, but ranging also over folklore, ethnology, science generally—are marked as much by their independence and originality as by their suggestiveness, harmony, incisive vigour, and depth and breadth of insight. They have made him a force in literature to which only Sainte-Beuve, not Jeffrey, is a parallel. Swinburne styled him 'the first critic of our time—perhaps the largest-minded and surest-sighted of any age;' and Rossetti said the same. At last, in 1897, he published *The Coming of Love*, a selection of poems from periodicals; in 1898 *Aylwin*, a brilliant romance of artist and gypsy life, akin to *The Coming of Love* in theme ('Love's warfare with death') and in its characters, a gallery of portraits of contemporaries, and an important document for students of what Watts-Dunton called 'the renascence of wonder.' In 1905 he married, and on the 6th June 1914 he died. He edited several of Borrow's works, and wrote, besides the books already mentioned, *Studies of Shakespeare* (1910), and two novels, *Vesprie Towers* (1916) and *Carniola*.

See works cited at Rossetti; a book by James Douglas (1904); the *Life and Letters* by Hake and Compton-Rickett, with personal reminiscences by his widow (1916); W. Sharp's *Sonnets of the Century* (1887); Hake's *New Day* (1890); A. Miles's *Poets of the Century* (1892); Coulson Kernahan's *In Good Company* (1917).

Waugh, EDWIN, Lancashire poet, was born January 29, 1817, at Rochdale. On the expiration of his apprenticeship to a local printer and bookseller, he devoted himself almost entirely to literature. With his removal to Kelsal near Manchester he became one of the most active members of the Manchester Literary Club, of which he was at one time president. His first sketches of Lancashire life and character appeared in the *Manchester Examiner*, and at once attracted friendly attention to the author. Among his numerous prose writings may be cited his *Factory Folk during the Cotton Famine*, the *Besom Ben Stories* (possibly the best of his humorous pieces), *The Chimney Corner* (a series of exquisite village idylls), and the admirable descriptions of natural scenery in his *Tufts of Heather*, *Irish Sketches*, and *Rambles in the Lake Country*. His *Lancashire Songs*, collected from periodicals in 1859, secured for him immediate recognition as a poet. Rivalling the Cumbrian poems of Robert Anderson, and comparing favourably with the best work of the rustic followers of Burns, these rude lyrics won the hearts of his countrymen by their pathos and kindly humour, indeed few poems enjoy such popularity in Lancashire as 'Come whoam to thi childer an' me.' The nice shades of local *patois*, in villages separated by only a few miles, are tenderly discriminated, and the idiom is nowhere maintained to the tedium of the general reader. With failing health Waugh removed to New Brighton, Cheshire, where he died 30th April 1890.

Wauke'gan, capital of Lake county, Illinois, on the west shore of Lake Michigan, 36 miles by rail N. by W. of Chicago. It is mostly built on a bluff, 50 feet above the lake. Pop. (1920) 19,226.

Waukesha, capital of a county in Wisconsin, on Fox River, 16 m. W. of Milwaukee; pop. 12,500.

Waurin, JEHAN DE, an old English chronicler, whose work comes down to 1471. The *Recueil des Croniques et Anciennes Istories de la Grant Bretaigne* was edited for the Rolls series (5 vols. 1864–91). Vols. i.–iii. were translated in 1864–97.

Wausau, capital of Marathon county, Wisconsin, 210 miles NW. of Milwaukee; pop. 18,600.

Wauters, EMILE, Belgian painter, born at Brussels, 29th November 1846, studied under Portaels and Gérôme, and showed precocious talent in producing huge historical canvases (two of which are in the Town Hall, Brussels, and the remainder in various Belgian museums). He later developed into a brilliant portrait-painter, but some of his work is apt to lack warmth and conviction.

Wave. When the surface of a sheet of water is disturbed waves are invariably produced. These may vary in magnitude from the huge rollers of the Atlantic to the tiniest observable ripple. The broad characteristic of such wave-motion is that as the waves pass over the surface at a considerable speed the liquid itself simply rises and falls with a slight to-and-fro motion in a steady rhythmic manner. The wave, in short, is a particular state of motion handed on from one portion of the water to another. It is energy, not matter, that is transmitted. In the case of ordinary sea-waves it is not easy to see that gravity is the effective dynamic agent in their propagation. In accordance with hydrodynamic principles the tendency must be for the water at the crest of a wave to be pulled down to the level of the water in the neighbouring trough, and for the latter to be pushed up to the level of the former. Corresponding to this surface oscillation there must be at any point below the surface an oscillation in pressure. Also at any instant the pressure will vary from point to point along a horizontal line drawn in the fluid in the direction in which the wave-motion is being propagated. These conditions obviously imply a definite motion of the particles of the fluid. If we suppose this motion of the fluid itself to be so small that we may neglect the square of its value, we are able to determine mathematically the character of the motion in the simplest type of oscillatory waves sustained by the action of gravity. Two simple cases are usually distinguished according as the length of the wave is great or small compared with the depth of the liquid. In the former case we have the propagation of long waves in shallow water. Each particle of liquid describes an ellipse with longer axis horizontal. As the depth increases this ellipse diminishes in size, and becomes more elliptical. At the bottom the liquid simply moves to and fro in a straight horizontal line. The velocity of the wave is equal to the square root of the product of the total depth of the liquid into the acceleration due to gravity, in symbols $\sqrt{gh}$. The shallower the water the more slowly will the waves pass.

In the other simple case we find a type of which the deep-sea wave may be taken as an example. Each particle of fluid describes a circle, which rapidly diminishes in size as the depth increases. The velocity of wave-propagation is given by the formula $v^2 = gl/2\pi$, where l is the wave-length and π is the ratio 3·14159... . Thus, with a wave-length 4π or about 12·6 feet, the velocity of propagation will be 8 feet per second or 5·6 miles per hour. Again, with a wave-length of 100π—a length by no means uncommon with Atlantic rollers after a gale—the waves will travel at 40 feet per second or 27·3 miles per hour. Atlantic waves from 500 to 600 feet long and from 44 to 48 feet high have been observed to take from 10 to 11 seconds to pass. This gives a velocity of 50 or 55 feet per second. The theoretical formula gives 50·6 and 55·4 feet per second respectively. The Hydrographical Bureau of Washington records the observation of a wave half a mile long which took 23 seconds to pass. According to the formula it should have taken 22·7 seconds. These comparisons show that so far as the value of the velocity is concerned the simple theory is very satisfactory.

This theory, which is avowedly an approxima-

tion, gives a wave form whose crests are similar to the troughs. Now a glance is sufficient to show that the crests are sharper and the troughs flatter than this similarity would require. Stokes has, however, carried the approximation a step further, and finds that the steeper crests and flatter troughs are quite accounted for; also that the particles are, on the whole, carried forward in the direction of propagation of the wave.

In the case of oscillatory waves the disturbance, as already noted, rapidly diminishes as the depth increases. Thus at a depth equal to one wave-length the disturbance of the water is only $\frac{1}{535}$th of that at the surface; and at a depth of two wave-lengths, only $\frac{1}{300000}$th of that at the surface. With the largest ocean waves the agitation has an inappreciable effect at even moderate depths.

Near a shore-line or beach the to-and-fro motion of water along the bottom must have its effect on the material accumulated there. Signor Cornaglia has made some very valuable observations on the formation of beaches along the shores of the Mediterranean. He finds (as the theory also indicates) that the bottom water under a crest moves in the direction of the wave-motion, and that the water under a trough moves in the opposite direction. A stone or other object lying on the bottom will, as wave follows wave, be subjected to pressures acting in alternate directions. If the bottom is inclined, as in the case of a shelving beach, the shoreward push due to a passing crest is greater than the seaward push when the trough is passing. The seaward push will, however, be aided by the resolved part of the weight of the stone acting down the slope. At a certain depth, depending on the inclination of the slope and on the size of the waves overhead, the landward push will just be balanced by the seaward push together with the resolved part of the weight. In shallower depths, that is, nearer the shore, the landward push will have the advantage, and the effect of the waves will be to carry material up the beach. On the other hand, in greater depths, that is, farther from the shore, the other forces will have the advantage, and the materials will tend to be carried out to deeper water. Thus there exists near to every shore a neutral line or strip, above which sediment tends to move up, and below which it tends to be carried away to greater depths. In the Mediterranean this neutral line lies at a depth of from 26 to 33 feet. Signor Cornaglia shows the importance of this phenomenon in relation to estuaries and harbours, which become silted up if their mouths and openings are on the land side of the neutral line, but remain deep if their outlets are on the sea side of the neutral line.

As oscillatory waves flow in upon a shelving beach they gradually change character. The troughs become flatter, and the crests become sharper. At length the crest begins to curl over, and finally topples as a breaker upon the beach. If we regard these waves as oscillatory waves in shallow water, we see that their velocity should diminish with the depth. Hence there is a tendency for the advancing wave, which, so to speak, strives to keep its original momentum, to be retarded by friction on the bottom. Hence the crest tends to outstrip the lower parts of the wave, and the result is the breaker. It is certain, however, that as the depth becomes smaller and smaller the waves lose their true oscillatory character and become solitary waves or waves of translation.

The solitary wave was discovered and studied by Scott Russell, the eminent engineer. To this class belongs the long wave which accompanies a canal-boat, and which we see traversing the canal when the boat is stopped. The most favourable rate at which a canal-boat can be drawn is when its velocity is such that it rides on the crest of the solitary wave. When this condition is not fulfilled part of the work done by the horse is expended in producing fresh solitary waves. The speed of the wave is measured by $\sqrt{gh'}$, where h' is the height of the crest of the wave above the bottom of the canal. In a canal 8 feet deep the boat's most favourable speed would be a little greater than 16 feet per second, or about 11 miles per hour. Boussinesq and Rayleigh have worked out the theory of the solitary wave, and their conclusions agree very well with the observations made by Scott Russell. For example, the latter observed that when the height of the wave was equal to the depth of the undisturbed liquid the wave began to break; and the theory shows that with this relation of depth and height the water at the crest is moving horizontally with the speed of the wave. One characteristic of this solitary wave is that when it is a crest the water is displaced forward a definite amount and does not return. On the other hand, when it is a trough the water is displaced backward—i.e. opposite to the direction of propagation of the solitary trough. For this reason the solitary wave is also called the wave of translation. It is found that a solitary trough is very unstable; and it is doubtful if a solitary crest can remain permanently of the same form even on a frictionless fluid.

Stationary waves in running water, such as may be seen on any shallow brook with uneven bed, belong to another class of waves. One particular inequality, a large stone for example, will produce one conspicuous wave and a number of smaller ones accompanying it. The conditions of the problem are difficult to state; and very little has been done in the discussion of it. Lord Kelvin has shown that a certain relation between the speed of the water and the average depth determines whether there is a crest or trough formed over the inequality.

With water-waves whose wave-lengths are longer than 1 foot gravity is practically the efficient agent in propagating the wave-motion. But when the waves get small another agent comes into play —viz. the pressure due to the Surface-tension (q.v.) of the curved surface of the water. This pressure acts downwards over the convex crest and upwards over the concave trough. Its magnitude increases with the curvature, which becomes greater as the wave-length becomes smaller. Thus the influence of the surface-tension in accelerating the speed of the wave becomes more pronounced as the wave is taken shorter and shorter. When a wavelet becomes so small that the surface-tension is more effective than gravity, it is distinguished by the name of ripple. There is a certain particular wave-length for which gravity and surface-tension have equal effects as regards the speed. Shorter wave-lengths are ripples, longer wave-lengths are waves; and the speed of the wavelet having this critical wave-length is a minimum. All other ripples and waves, whatever be their wave-lengths, travel faster. For any speed greater than this minimum speed two wave-lengths correspond. In other words, for any given wave propagated mainly by gravity there corresponds a ripple propagated at the same speed mainly by surface-tension. These statements are all contained in the following formula which expresses the speed (v) of waves on the surface of fresh water in terms of the wave-length (l): $v^2 = 61{\cdot}4l + 31/l$. The units are the inch and second. The first term on the right is the part due to gravity, the second the part due to surface-tension. The minimum speed (9·34 inches per second) is given when these two terms equal each other, so that the critical

wave-length which separates ripples from waves is 0·71 inch. When the wave-length is $2\frac{2}{3}$ inches the speed is $12\frac{1}{2}$ inches per second, instead of 12 inches per second as it would be under the influence of gravity alone. Now the same value of v is obtained if we substitute 0·217 for l in the formula. That is, the *ripple* of wave-length 0·217 inch travels with the same speed as the wavelet of wave-length $2\frac{2}{3}$ inches. It is easy to see from the formula just given that the product of the wave-lengths (in inches) of the ripple and wavelet which move with the same speed must equal $\frac{8}{9}\frac{1}{4}$ or ·505, so that if the one wave-length is given the other can be at once calculated.

A very pretty experiment due to Scott Russell, but first discussed fully by Lord Kelvin, gives a practical demonstration of the fact that to every ripple there corresponds a wave having the same speed. Let a thin rod, dipping vertically in smooth water, be drawn through it at a speed of 10 inches per second or more. In front of the rod a group of ripples advancing with it will be formed, and behind will be seen the corresponding wavelets travelling also with the rod. These combine to produce a beautiful pattern on the surface of the water. If we increase the relative speed of the rod and the water the ripples in front get shorter, and the wavelets behind get longer. On the other hand, a diminution of speed causes the ripples to lengthen and the wavelets to shorten until for a particular speed they are equal in wave-length. For slower speeds wave patterns are not formed.

Any disturbance of the surface of water results in the formation of waves. A stone falling in, or a fish rising, produces a series of wavelets or ripples travelling outwards in widening circles. Of all agents that have to do with the generation of waves wind is, however, the most effective. An almost inappreciable puff of air will produce tiny ripples on an otherwise smooth water-surface. The first production of such ripples must depend upon the variations of vertical pressure accompanying the breeze; but once they are fairly started the momentum of the wind itself will have its direct influence on the wavelets. The power of wind in lashing up the surface of water is shown on a grand scale in every storm at sea.

Besides water-waves, which have been the chief object of discussion in this article, there are numerous other kinds of wave-motion which are essentially involved in many physical phenomena. For example, Sound (q.v.) has to do with waves travelling in elastic media, either as waves of compression and dilatation or as waves of distortion. A similar kind of wave-motion accompanies Earthquakes (q.v.). Then, again, the whole of physical optics is built upon an elaborate theory of wave-propagation, the exact nature of which is yet to be discovered (see LIGHT, POLARISATION, &c.). Maxwell's brilliant theory that the wave-motion which constitutes light is an electric rather than an elastic phenomenon has virtually carried the day; but it remains to find a dynamical explanation of electricity itself, or, at any rate, to conceive an ethereal medium whose fundamental property is a capacity to transmit wave-motions of the kind required. For phenomena depending on the co-existence of wave-motions, see INTERFERENCE. See also works on various kinds of waves by Dr Vaughan Cornish (1901–12), and HARBOUR.

Waverley. See FARNHAM.

Wavre, a town of Brabant, 15 miles SE. of Brussels; pop. 9000. Here on 18th June 1815 there was a fiercely contested battle between the Prussians under Thielmann and the French under Grouchy, in which the Prussians successfully prevented the French from joining Napoleon at Waterloo.

Wax, the name given to some animal and vegetable substances, and even to one or two mineral bodies, which more or less resemble beeswax both in their appearance and in their physical properties. Beeswax and Chinese *pe-la* wax are of animal origin: Carnauba palm-wax and myrica-wax are vegetable products; and ozokerite (see BITUMEN) and montan-wax are examples of mineral wax. The true waxes differ from fats in not yielding glycerine when they are made into soaps with alkalies.

Beeswax is secreted by bees, and of it they build the walls of the cells of their comb. When this is drained of honey it is melted in boiling water, and the wax which floats on the surface is collected in the solid state when the water cools. Raw beeswax is of an impure yellow colour, so that for many purposes it requires to be bleached. Its fracture is finely granular, and it has a peculiar glistening appearance when rubbed, which, when seen in other bodies, is called waxy. The melting-point of beeswax varies from about 58° to over 63° C., and its sp. gr. is ·960. It is soluble in ether, turpentine, benzole, and some other liquids, but not in alcohol. It contains about 85 per cent. of *myricin*, a compound of one of the higher ethers of the ethyl series with palmitic acid. Myricin is a crystalline fatty body melting at about 72°C., and having the formula $C_{15}H_{31}COOC_{30}H_{61}$. It differs from ordinary fats by yielding on saponification myricyl alcohol, a crystalline fatty body, in place of glycerine. *Cerotic acid*, $C_{27}H_{54}O_2$, is also present in beeswax to the extent of about 12 per cent., and generally in the free state. This acid is dissolved by boiling alcohol, in which the other bodies composing wax are insoluble. As both myricin and cerotic acid are crystalline and brittle, and melt at higher temperatures than wax itself, the tenacity and plastic character of the latter is ascribed to the presence of a comparatively small quantity of a softer substance named *cerolein*, which does not seem to have been as yet thoroughly investigated. *Melissic acid* ($C_{30}H_{60}O_2$) was first prepared by Brodie from the myricin of beeswax, in which it has since been found in the free state. It is one of the highest known members of the fatty acids. It fuses at 90° C.

Beeswax is bleached by dividing cakes of it into ribbons, which are spread on canvas, kept moist and exposed to sunshine. The ribbons are turned over at intervals, and occasionally sprinkled with water. After a first bleaching the wax is melted, formed once more into ribbons, and again exposed to the sun's rays. A third treatment of the same kind is usually required. Only solar bleaching will suit when it is to be used for candle-making, and for this purpose the wax also requires a previous treatment with acid. Wax can, however, be bleached with chemical agents. Candles of this material cannot be made, like those of stearin or paraffin, in moulding machines, since they do not part freely from the moulds. They are manufactured by first pouring melted wax on wicks arranged round a hoop, and when they have reached the proper thickness they are rolled in the plastic state on a marble slab. Candles of beeswax, owing to its greater hardness, have less tendency to 'gutter' than those made of stearin or paraffin. Beeswax has also a pleasant odour. By itself it makes by far the best carriage candles, and when these are made of other materials beeswax is sometimes mixed with them. But its high price limits its use for such purposes. It is employed for waxing floors of polished wood, as an ingredient in making some varnishes, for making lithographic crayons, and as a resist in printing patterns on calico.

Wax was of importance to the ancients for writing-tablets (see WRITING), the writing pro-

duced by the sharp end of the stylus being, when it had served its purpose, obliterated by the other end. The art of modelling figures and portraits in wax dates from prehistoric times. Beeswax was used for this purpose by the ancient Egyptians. The ancient Greeks practised the art with great skill at least 300 years B.C., and developed the method of casting in bronze by means of wax now known as *cire perdue* (see FOUNDING). The Romans were wont to have wax portraits of their ancestors set up in their entrance-halls as evidence of ancient pedigree. Wax was also the material with which the colours for *encaustic* painting practised by the ancients were made up. The remarkable portraits, believed to have been executed in the earlier centuries of our era, which were discovered by Sir Flinders Petrie at Fayyûm in Egypt, were painted with pigments laid on with melted wax. A modern kind of encaustic (see MURAL DECORATION) is sometimes called *wax-painting*. Wax images were used with evil intent in magic. An enemy was believed to waste away as his image melted. In the 14th and 15th centuries sculpturing in wax, or cero-plastics, was practised by artists of good standing, who have left mainly figures in low relief or statuettes. But Vasari praises a large portrait statue of Lorenzo de' Medici by Verrocchio and Orsino, of which the framework was wood, clothed with real garments, the face, head, and hands being of wax. But no skill evades the lividness of the flesh or the ghastly stare of the glass eye; and wax portraiture has been abandoned by artists proper, and left to the skilful workmen who manufacture portrait figures of royal personages, popular characters, and distinguished murderers for shows, perambulating or permanent. Of the latter that of Mme. Tussaud (q.v.) is the best known. Wax-modelling has also a humbler sphere in the making of one kind of artificial flowers, composed of thin leaves of coloured wax, surface painted in detail with proper pencils, and artificial fruit, and in producing tailors' dummies, as well as anatomical models and pathological specimens; and embryological models, now much used in the teaching of zoology, are usually made of wax.

Beeswax is produced in nearly all temperate and tropical countries. Much is got in southern Asia and North Africa. East Indian wax mostly comes from hilly regions, the produce of wild or half-wild bees.

Vegetable waxes seem to be mere waste-products, though sometimes a plant may find a use for them. A coating on the leaves reduces transpiration in some xerophytes.

Chinese wax is produced by *Coccus ceriferus*, Fabr. (*Coccus pe-la* of Westwood), living on an ash-tree *Fraxinus chinensis*, and belonging to the same genus as the lac-insect (see LAC). This beautiful substance resembles spermaceti in general appearance. It has a highly crystalline structure, and is very hard for a wax, its melting-point being 81° C. Chemically it consists chiefly of ceryl cerotate. Although this should be an excellent material for making candles, their manufacture from it presents some points of difficulty. It is perhaps owing to this, still more to its high price, that the wax has never become an article of much commercial importance in Europe. But it is so in China and Japan, where it is used for making candles, or for coating candles of inferior materials, and also for sizing paper and textiles. Its specific gravity is ·970, and it is slightly soluble in alcohol and completely so in light hydrocarbons.

A wax similar to the Chinese pe-la is produced in Japan by an insect which is probably another species of coccus living on *Ligustrum Ibota*. It is, however, not abundant enough to be of industrial importance.

Spermaceti.—See this head.

Carnauba wax is found in thin films on the leaves of a Brazilian palm (*Copernicia cerifera*). It consists chiefly of myricyl cerotate and myricyl alcohol. Its melting-point is 85° C., rising to about 91° when long kept, and its specific gravity is about ·99. This substance is made into candles to a large extent in Brazil, but it is only used in limited quantities in the candle manufacture in England. A small proportion of it mixed with other candle-making materials is useful in destroying the 'mottle' which some of these have a tendency to show. Carnauba wax is used to adulterate beeswax, and on the Continent to mix with such substances as stearin and cerosin to make cheap 'wax' candles for church purposes. It is also used in the manufacture of wax varnishes, and is mixed with commercial stearic acid, paraffin, &c., for the purpose of raising their melting-points.

From the stem of *Ceroxylon andicolum*, the wax-palm of the Andes, a resinous exudation is obtained, about one-third of which consists of a wax used for making candles (see PALM). A similar substance is produced by *Ceroxylon Klopstockia*, another South American palm.

Japan wax is obtained from the fruit of several species of Rhus, of which *R. succedanea* is the most important, but *R. vernicifera* also yields it. The berries contain the wax between the kernel and the outer skin. The raw wax is of a greenish colour, and is cut into strips and bleached white by exposure to the sun. This wax is mostly composed of palmitin, and is therefore rather a fat than a true wax. Its melting-point varies from 51° to 53° C. It is important as a candle-making material in Japan, although but little used for this purpose in England. It has a rather unpleasant smell. Japan wax is an ingredient in some polishing mixtures for furniture and leather. Wax is one of the principal articles of export from Japan, and a varying quantity is imported into Britain.

Myrtle-berry Wax.—The berries of several species of Myrica are coated with a waxy substance. In the United States the wax from *M. cerifera*, which is a rather soft greenish substance, with a melting-point of 123° F., has been much used (more or less mixed with beeswax) for candle-making. It consists most largely either of free palmitic acid or of palmitin with some myristin. *M. cordifolia*, *M. quercifolia*, and *M. laciniata* of South Africa and *M. caracassana* found in South America yield myrtle-wax (see CANDLEBERRY).

Paraffin-wax.—Solid paraffin is so called. When of good quality for candle-making, it is a comparatively hard, pure white substance resembling beeswax, but rather more translucent. It has neither taste nor odour, and is not acted on by either alkalies or acids, with the single exception of nitric acid, which slowly attacks it, but only when this acid is at or near its boiling-point. Paraffin dissolves with the aid of heat in various naphthas (those from shale, petroleum, and coal-tar), in turpentine, ether, bisulphide of carbon, and to some extent also in alcohol and fatty oils. Paraffins are found in commerce with various melting-points, but all are mixtures of hydrocarbons belonging to the marsh-gas or paraffin series (see HYDROCARBONS). Those melting between 21° and 48° C. have a crystalline structure and are classed as soft paraffins. Such as melt between 46° and 66° C. (about the highest that can be made) are called hard paraffins, and in these the crystalline texture disappears. The hard are less easily dissolved than the soft kinds.

Besides its extensive use in candle-making, paraffin is employed for a great many purposes in the arts, such as for laundry purposes along with starch, for dressing textile fabrics and for render-

ing them waterproof, for manufacturing perfumes from flowers, for giving a finish to certain articles made of wood, bone, or leather, for embedding objects to be sliced for microscope work. In the United States it has been extensively consumed as a chewing-gum, and has been tried with some success as a preservative of fruit. Soft paraffin is largely bought for dipping matches. Paraffin purified without the use of acid has come into extensive use as an insulator by electricians. See PARAFFIN, CANDLE, and HYDROCARBONS.

Montan-wax, obtained from Thuringian lignite, contains montanic acid combined with an alcohol radicle. It undergoes saponification with alkalies. It is a hard lustrous wax melting between 80° and 90° C.

Sealing-wax (q.v.) is not now made of wax.

Wax-bill (*Estrelda astrilda*), a well-known small South African bird, much in repute in other lands as a cage-bird, is about 4 inches long, and has a bright red bill, the translucency of the horny covering giving it a waxy appearance.

Wax-cloth. See FLOORCLOTH.

Wax Insect. See WAX.

Wax-myrtle. See CANDLEBERRY, WAX.

Wax-palm. See PALM, WAX.

Wax-plant. See ASCLEPIADACEÆ.

Wax-tablets. See WRITING.

Wax-tree (*Vismia*), a genus of plants of the family Hypericaceæ, having a five-parted calyx, and five petals, generally covered with soft hairs on the inside. All the species yield a yellow resinous juice when wounded, which, dried, has similar properties and appearance to gamboge, and in commerce is named American gamboge. The species are natives of tropical America.

Wax-wing (*Ampelis*), small passerine birds in which the secondary quills of the wings, and sometimes certain feathers of the tail, have little red tips, usually like sealing-wax. The Bohemian Wax-wing or Chatterer (*A. garrulus*), breeding in the northern hemisphere of both old and new worlds, is an irregular winter visitor to Britain. It has nothing particularly to do with Bohemia, and it is not a chatterer. It feeds on insects and fruits.

Bohemian Wax-wing (*Ampelis garrulus*).

Two other species are *A. phœnicoptera* in Japan, China, and Siberia, and the smaller Caroline Wax-wing or Cedar-bird (*A. cedrorum*). The former has red tips, but they are not wax-like.

Waxy Degeneration (also called *amyloid* or *lardaceous* degeneration) is a morbid process in which the healthy tissue of various organs is transformed into a peculiar substance, allied in its chemical composition to albuminous substances. Organs affected by this degeneration have a certain resemblance in consistency and physical character to wax. They may be cut into portions of the most regular shape, with sharp angles and smooth surfaces; and the thinnest possible slices may be removed by a sharp knife for microscopical examination. Such organs are abnormally translucent, increased in volume, solidity, and weight. Usually the first parts affected by this degeneration are the small blood-vessels, the middle or muscular coat being first changed. Subsequently the adjoining tissues become similarly affected. When a solution of iodine is brought in contact with such tissues, a deep reddish-brown colour is produced; and this colour is alone a sufficiently characteristic test. Although amyloid degeneration is common to many tissues and organs, the parts most frequently affected are the spleen, liver, kidneys, lymphatic glands, and intestines. Waxy degeneration is very rarely met with as a primary condition. It is almost always the sequel to some chronic wasting disease, and is particularly associated with profuse and long-continued suppuration, as in tuberculosis of bone, diseases of the lungs, kidneys, or intestines, with much purulent discharge; and with advanced constitutional syphilis. It can thus rarely be regarded as itself the cause of death, though it may materially hasten the fatal issue. No treatment is known to be of any avail; but when the degeneration is not very far advanced, it may gradually disappear if the suppuration or other morbid condition which has led to its development is arrested.

Wayland, the Smith (O.E. *Wéland;* Old Norse, *Völundr;* Ger. *Wieland*), a hero of Germanic saga, who was originally a kind of demi-god in popular mythology, with points of identity with the Greek Hephæstus and Dædalus. He was son of the sea-giant Wade, a nephew of King Wilkinus, and was first bound apprentice to the famous smith Mimir. Then he was carried across the sea to the dwarfs, whom he soon surpassed in their own science. He dwelt a long time in Ulfdaler along with his two brothers, Eigil, the best archer, and Slagfidr, and here they met three swan-maidens, with whom they lived for seven years, until these flew away to follow battles as Walkyries. Afterwards Wayland came to King Nidung, who cut the sinews of his feet and put him in prison, for which he revenged himself by putting the king's two sons to death, and violating his daughter Baduhild, who afterwards gave birth to Wittich. Wayland then flew away in a feather-robe, which he himself manufactured, and which his brother Eigil had tried first, only to be precipitated to the ground. By skilfully piecing together the various old legends, Simrock produced the Saga of Wayland as a whole in his poem *Wieland der Schmied* (1835), and in the 4th part of his *Heldenbuch* (1843). The legend is often alluded to in Scandinavian, Old English, and German poems, and even old French poems tell of Galant the smith. Hauptmann has made it the subject of a play (1925); Miss K. M. Buck of a gigantic epic (1924 *et seq.*). Wayland Smith's Cave, a two-chambered megalithic monument, near the White Horse in Berkshire, is immortalised in *Kenilworth.*

See Depping and Michel, *Veland le Forgeron* (1838); Grimm's *Deutsche Mythologie;* Müller, *Mythologie der deutschen Heldensage* (1886); Golther, *Die Wielandsage* (*Germania*, vol. xxxiii.); Maurus, *Die Wielandsage* (1902); Rendal Harris, *Picus who is also Zeus* (1917); Peers and Smith, 'Wayland's Smithy' in *Antiquaries' Journal*, i. 3 (July 1921).

Wayne, ANTHONY, an American general, was born at Easttown, Pennsylvania, January 1, 1745, the grandson of a Yorkshireman who commanded a body of dragoons at the battle of the Boyne, and emigrated to Pennsylvania. Raising in 1776 a

regiment of volunteers, he was appointed colonel of it, and sent to Canada, where he covered the retreat of the provincial forces at Three Rivers. He commanded at Ticonderoga until 1777, when he was made brigadier-general, and joined Washington in New Jersey. He fought bravely at Brandywine; led the attack at Germantown; captured supplies for the distressed army at Valley Forge; distinguished himself at Monmouth; was defeated at Paoli; but achieved his most brilliant victory in the carrying of Stony Point with the bayonet at midnight, July 15, 1779. His courage and skill saved Lafayette in Virginia in 1781; and he aided in the siege of Yorktown. At the close of the war, rewarded by popular enthusiasm, and having, by his dash and audacity, acquired the sobriquet of 'Mad Anthony,' he retired to his farm in Pennsylvania, subsequently took up a tract of land granted to him in Georgia, and sat in congress for a few months. Appointed, on Washington's recommendation, in 1792 general-in-chief of the army, he next year commanded a successful expedition against the Indians of the north-west, founded Fort Wayne, and in 1795 signed a treaty with the Indians by which the United States acquired a large addition of territory. He died at Presque Isle (now Erie), Pennsylvania, 15th December 1796.

Way, Right of. See Right of Way.

Ways and Means. See Parliament.

Wazan, an inland town of Morocco, picturesquely situated on the steep northern slope of a two-peaked mountain, in the hill-country 90 miles SE. of Tangier; pop. 16,000. It is a sacred city and a place of pilgrimage, the headquarters of the Grand Sherif. The principal buildings are the great mosque and the tombs of a long line of sherifs. The trade is, as elsewhere in Morocco, mainly in the hands of the Jews.

Wazirabad, a town of the Punjab, 21 miles N. of Gujranwala by rail; pop. (1921) 18,645.

Waziris, an Afghan hill tribe, inhabiting the highlands between the Kuram and Gomul passes on the western frontier of the Punjab—now included in the North-west Frontier Province of India.

Weald. See Kent, Sussex.

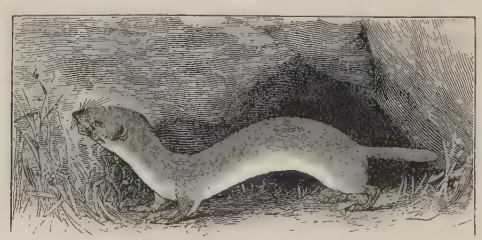
Wealden Beds. See Cretaceous System.

Wealth. See Capital, Political Economy, Value.

Weaning. See Infant (Feeding of).

Wear, a river of Durham (q.v.), 65 miles long. See also Sunderland.

Weasel (*Mustela nivalis* or *Putorius vulgaris*), the smallest carnivore in Britain, if not in the world. It is nearly related to the stoat or ermine (*Mustela erminea*), from which it may be distinguished by its much smaller body. The tail is also much shorter, only about two inches in length, and there is no black tip. It is reddish-brown



Weasel (*Putorius vulgaris*).

above and white below. British representatives of the stoat species often put on white fur in winter, turning into ermine, but this is rarely the case with British weasels. Yet the winter fur is paler, and in countries further north the change to white is normal. Most of the white weasels seen in Britain are permanently white albinos, with red eyes. The weasel has a wide distribution in the northern parts of Europe, Asia, and America. The body of the male is about eight inches in length, not including the tail. The female is distinctly smaller. The fur is sometimes used, but the animal is too small to be commercially important. The weasel's swift movements enable it to efface itself like magic; its slim, almost snake-like, body enables it to disappear into holes; it can climb and swim equally well. Another quality that makes for survival is the long bill of fare, for it is known to catch half a dozen kinds of small mammals and as many species of small birds. It can overtake the young rabbit, follow the field-mouse into its hole, and climb to a bird's nest on the branch of a tree. It sometimes sucks birds' eggs, and may condescend to frog and toad. A small mammal is usually killed by biting the skull, a procedure that leads quickly to the brain, but an attack is often made on the blood-vessels of the neck. Of great interest is the device, also exhibited by stoats, of gambolling before small birds, who sometimes become spellbound and allow the weasel to make an easy victim of at least one of them. Another predatory method that is hardly less surprising is hunting in small 'packs' of five or so, perhaps in some cases a family party under the mother's charge. The little troups have been often described as 'fairy hounds' and 'dandy dogs.' It may be noted that the occasional harm that weasels do to young game-birds and the like is far outweighed by the service they render in checking the multiplication of field-mice, voles, and even rats. Sometimes, as with other high-strung carnivores, the weasel kills much more than it needs, obedient to a blood-thirsty predisposition or instinct. But this rarely happens in wild nature. Weasels have been known to store their superfluity, though it does not keep well for more than a few days. Against the weasel's fierceness must be balanced its maternal care. In early summer, often in June, the young ones, four to six in number, are born in a nest of grass and leaves, hidden in a hollow tree, a secluded hole, or a stack of corn. There is usually only one litter in the year. The mother carries her young before birth for about forty days, and they are born very helpless, unable to see for about three weeks. During that period they are fed exclusively on milk, but when they get their sight the mother brings them flesh. She will shift her brood, one by one, if the retreat is menaced, and, if need be, she will fight valiantly for them, careless of death. Young weasels can be kept as pets; they are cleanly, playful, and inquisitive. Weasels are common throughout England, Wales, and Scotland; but do not occur in Ireland. Among their many names may be noted whittret, futteret, vair, mouse-hunter, and fairy hound. The female is much smaller than the male, and this is probably the basis for the widespread belief that there is another species, 'a small edition of the weasel,' to which the name 'cane' or 'mouse-weasel' is applied. When it is asked how weasels hold their own in a country like Britain, with the shrinking of wild places, and with many a hand against them, the answer must be found in the fact that they are fearless, fond of living dangerously, keen of sense, quick of foot, nimble of wits, inquisitive, resourceful, and as effective in mothering as in predatory enterprise.

See Mortimer Batten's *British Wild Animals* and J. J. Simpson's *British Mammals*.

Weather. See METEOROLOGY, STORMS; also RAIN, WIND, SNOW, &c.

Weathering. See DENUDATION.

Weaver-bird (*Ploceidæ*), a family of passerine birds numbering between 200 and 300 species, which bear considerable resemblance to the finches, and are, indeed, often spoken of as such. The name has reference to the remarkable structure of the nests of many of these birds, which are woven in a very wonderful manner of various vegetable substances, and are objects of great interest. The Ploceidæ are natives of the warmer parts of Asia, of Africa, and of Australia; none being found in Europe nor in America. They are small birds, with a strong conical bill, the ridge of which is slightly curved, the tip entire. The wings are pointed or rounded, the first quill remarkably short, and the males of many species have a distinct summer and winter plumage, the former acquired by moulting some of the feathers. This is the case in the genus Pyromelana, for example, in which the males in full plumage are adorned with the most brilliant yellow, orange, or scarlet, set off by velvety black. They are often called 'bishops;' and the species represented is yellow above and black below, with brownish wings and tail, when 'in colour' as shown. There is great diversity in the form and appearance of the nests constructed by different species. One of the best-known species is the Baya of India. Many of the other weaver-birds construct nests pretty much on the same plan with this—pouches elongated into tubes, entering from below; those of some are kidney-shaped, and the entrance is in the side. They very generally suspend their nests in the same way from the extremities of branches, and often prefer branches which hang over water, probably as affording further security against monkeys, squirrels, snakes, and other enemies. Social habits are very prevalent among them, and many nests of the same species are often found close together. Some of them attach the nest of one year to that of the year preceding, as the *Nelicurvixes nelicourvi* of Madagascar, which sometimes thus makes five nests in succession, one hanging to another. Some of the African species build their nests in company, the whole forming one structure. Thus the Social or Republican Weaver-bird of South Africa (*Philetærus socius*), often called Social Grosbeak, constructs a kind of umbrella-like roof, under which 100 to 200 nests have been found, the nests like the cells of a honeycomb, and arranged with wonderful regularity. An acacia with straight smooth stem, such as predacious animals cannot easily climb, is often selected by the bird-community. When the situation is chosen, the birds begin by constructing the roof, which is made of coarse grass, each pair afterwards building their own nest, which is attached to the roof. As new nests are built every year, the weight of the structure often becomes so great as to break down its support. The Red-billed Weaver (*Textor panicivorus*) is a large species of the weaver-bird group, which is commonly seen in South Africa accompanying herds of buffaloes, and feeding on the bots and other insects which infest them, alighting on their backs to pick them out of the hide. The bird is often of great use to the buffalo in another way, by giving warning of the approach of an enemy. The Whydah Birds (q.v.) likewise belong to the group of Ploceidæ; and a large number of (usually) small seed-eating birds, commonly imported as pets, are referred to this family, such as Avadavats or Amadavats (*Estrelda amandava*), Waxbills (Pytelia), Mannikins (Munia—not to be confused with the Manakins, i.e. Pipridæ), and the well-known 'Java Sparrow' (*Munia oryzivora*), of which there is a white domestic variety. The 'Bengalese' of bird-dealers are white and pied varieties of a Mannikin (*Munia striata*) domesticated for centuries in Japan; and many other Ploceidæ will breed, more or less freely, in captivity.

Baya Weaver-bird and Nest (*Ploceus baya*).

Weaving. A woven fabric is the effect of interlacing 'warp' or 'chain' and 'woof,' 'weft,' or 'filling' yarns together. The former are complete in measurement and number at the beginning of the weaving operation, and vary in length and multiplicity with the fineness or gauge, and the dimensions of the piece of cloth to be produced. The latter are inserted into, or crossed with, the warp in a prescribed order, 'pick' by 'pick' or 'shot' by 'shot,' by the passage of the shuttle, containing the filling yarn, from side to side of the loom. How the principle of inter-texture came to be originated is a matter of conjecture. The simplest type of fabric—plain woven or 'calico,' fig. 5—resembles, in scheme of formation, elementary wicker or basket work, which surmises the invention of weaving as having proceeded by toilsome effort from the art of plaiting. First, natural substances, such as twigs and grasses, would be intermatted; and, second, following the discovery of spinning, yarns consisting of fibrous materials would be made into a textile structure. This step attained, the placing of a series of threads, vertically arranged and tensioned, in a frame, proportionate in size to the area of fabric required, would be presented as a convenient practice for interlacing functions, or for combining, in alternate order, individual shots of woof with collective threads of warp, capable of being mechanically divided in groups for shuttling purposes. All varieties, thicknesses, and qualities of fabrics—plain and ornamentative, gauze and lappet, velvet and pile—are derivatives of this basic principle of textural construction, which radically differs from the principle of work applicable to the arts of knitting and lace-making. Two series of yarns—warp and weft—are imposed, whereas in either a knitted or a lace structure simple threads are linked or looped with each other in the fashioning of the tissue.

Historic Data.—The craft is of great antiquity. Mummy-wrappings of the 1st Egyptian dynasty indicate that fine-fabric weaving was at that early epoch practised with exceptional manual dexterity. Those discovered in the tomb of King Zer (about 5400 B.C.), counting 160 threads of warp and 120 threads of woof in the inch, are comparable in this technicality with thin cambrics and muslins of modern manufacture. Ancient craftsmanship also extended to the production of figured cloths as exhibited in the tapestry specimen from the tomb of Tahutmes IV. (1414 B.C.), woven in brown, gray, red, blue, and yellow, and with the pattern skilfully delineated by passing the weft yarns across groups of warp-ends, and by stitching or binding the 'floating'

shots evenly at the edges. Pile-weaving was, moreover, ingeniously effected by drawing the shuttling threads into loops, which were symmetrically distributed over the face of the fabric. A 'terry' (= looped or buckled) or, if the loops were severed, a 'shag' (= cut or velvet) pile product was thus obtained, the first being the precursor of the terry or Turkish towelling and reversible pile carpet, and the second of velvet, velveteen, and plush textures. But Babylonia carried the weaver's art to a still higher standard in colour-richness and in decorative pattern and style. Guilds or schools of craftsmen transmitted the mysteries and technique of loom-work from one generation to another. Babylonish tapestries became the recognised models of wall and floor decoration in architectural design. This is exemplified in the remains of the palace-like buildings at Wurka, south of Bagdad, in which the small wedges of burnt clay, variously tinted and pressed on plaster, are arranged in loom-formed devices; as also in the ruins of Nineveh, where the floor-spaces are paved after schemes of ornamentation strikingly suggestive of having been copied from woven features. The teaching of this imitative practice is found in its bearing on the remote antiquities of weaving as a highly advanced decorative art, whether viewed in its relation to form and line grouping and pattern expression, or to freshness of colour-toning and beauty of colour-blending.

Turning to the Far East, China, with its insular civilisation, affords accredited data of weaving as a flourishing handicraft ages before the present era. Its ancient literature supplies a number of quaint references to cotton and linen wear, fine and coarse, and silk robes elaborately decorated and gorgeously tinted. While, however, the Chinese have apparently used silk in textiles from 2700 B.C., they do not appear to have employed the wool staple to any considerable extent. Amongst the primitive nations of Central Asia flax and cotton are known to have been chiefly selected. Silk is likely to have been imported, at a comparatively late period, from China; but wool was such an important material of commerce in their earliest history that, though in the excavated fabrics analysed it does not occur in the form of a woollen-yarn texture till Coptic times, the assumption is it was spun and thus woven at an anterior date. In the oldest bill-of-sale extant—the Chaldean tablet, 4000 B.C., found by M. de Morgan at Susa—wool is a principal item. Facts of this nature point to the extensive growth and trading in wool, either for use in the fleece as a covering, or as a staple for spinning and weaving. The aptitude and efficiency exercised in the preparation of flax or cotton for the loom would likewise qualify for the manipulative operations by which wool is rendered similarly adaptable. Hence it may be inferred that the ancient Egyptian weavers would employ woollen yarns in both warp and weft, but more particularly in the production of the coarse kinds of cloth.

Vertical-warp Weaving.—Two systems of weaving have been invented—namely, in which the warp-threads are operated in the *horizontal* and in the *vertical* plane respectively. One originated in the East and is restrictive of mechanical improvement; the second is the loom type developed in the West, though possibly known to the Chinese, and offers scope for inventive change and constructiveness.

The vertical-warp loom provides the system of dividing or 'shedding' the warp for the insertion of the shuttle, applicable to the weaving of Eastern and tufted carpets and tapestries, including Coptic, Gobelin, Beauvais, Brussels, Amiens, &c. The loom is little more than an upright framework in which the warp-yarns are extended, and spaced according to the grade and 'set' of the fabric woven. The yarns may be mounted to enable the weaver to draw them forward and wind up the cloth, but mechanical accessories for this purpose are not absolutely essential. For producing a plain texture, one half of the warp-yarns, or the odd threads, are drawn forward and a shot of weft passed across, when the other half of the yarns, or the even threads,

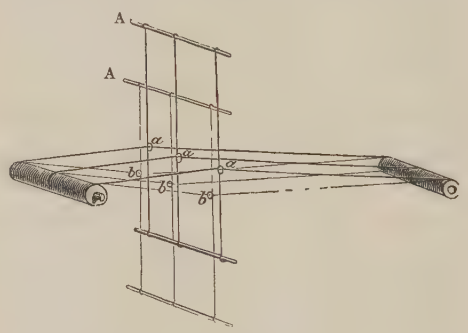


Fig. 1.

are advanced, and a further shot of weft introduced, each shot being forced or beaten by a hand-comb up to the 'fall' of the piece. To acquire these alternating thread evolutions, cords, corresponding to the healds (A, fig. 1) in the horizontal-warp loom, are attached to two staves or rods, the loops of the cords of one stave controlling every other thread in the warp; while the second stave governs the movements of the remaining threads. By successively drawing forward each rod, the requisite thread-and-thread crossing with the weft-yarns, for making a plain piece of cloth, is obtained.

It is a method of fabric-weaving which offers unrestricted facilities for textural colouring and design. The possible play on the insertion of colour-tones, and of variation in decorative treatment, is only measured by the ingenuity of the weaver and by the gamut of tinted yarns available. It follows that no horizontal scheme of dividing the warp is comparable with this arrangement in the means and latitude it gives for style origination. The explanation of this range in the ornamentation of the woven surface (always plain in structure) obtains in the feasibility of operating the warp-threads in selected groups, dispensing with the rod contrivance, which allows of the determination of the number of ends in a group by the lines, forms, and colour-units in the decorative or pictorial subject being texturally produced.

Preparatory Operations.—Before weaving can be proceeded with in the loom, the yarns intended to be used in the length of the cloth require to be specially prepared by *warping*, *beaming*, *healding*, and *sleying*. The first operation relates to grouping the yarns in a warp or chain, with each thread of the same length and in the place it will occupy in the fabric. Warping is performed on the woof (hand practice), the mill, and on combined warping, sizing, dressing, and beaming machines. In the first place, the bobbins or cops of yarn are arranged in a creel, combining a number divisional without remainder into the total ends in the complete warp and in the width of the piece. This is followed by transferring the threads, all under an equal tension, on to the warping frame or mill, repeating the procedure until the desired aggregate of threads has been warped. At the 'head' end of the warp a 'lease,' or counter-change intersection of the threads, is made, which is secured, on removing it from the machine, by inserting lease-bands. A similar crossing of the threads, but in sets of four, six, or eight, is also taken at the 'tail' or 'footing' end

of the chain. The latter lease is useful in 'raddling,' or coarse sleying, for winding the warp evenly on the chain-beam, that is, in the work of *beaming*, during which all threads should be of a like tightness and systematically distributed, otherwise an imperfectly woven cloth would ensue.

The chain-beam is now suspended behind the heddles (or harness, in Jacquard weaving), and the healding of the warp is carried out by the assistant selecting the threads separately from the lease—preserved by substituting a pair of rods for the lease-bands—and handing them, one by one, to the 'drawer-in,' who inserts his healding-hook, in correct sequence, into the healds of the shafts or 'mails' of the harness. If there are only two shafts in the mounting, as at A, A, fig. 1, the threads are entered into the eyelets, *a* and *b*, in succession; but if four shafts, into the healds of the first, second, third, and fourth consecutively; or, whatever the number in the series, in regular routine from the front to the back heddle, completing a 'gate' or 'repeat,' and duplicating the process to the last thread in the warp.

Sleying or reeding follows. It comprises the passage of the threads into the 'splits' or 'dents' of the reed or sley in the order of healding, and in sets of twos, threes, &c. tallying with the gauge of the cloth, and adapted to the thickness and fibrous nature of the yarns. Calicoes are sleyed in twos, and also the coarser builds of woollen fabrics, but many varieties of worsteds, unions, and silks, and of finer cottons and linens, are reeded in fours, sixes, eights, &c. The sley is fitted in the race or lower portion of the 'going-part' or 'batten,' D, fig. 2; and, in the to-and-fro traverse of the latter, it drives the shots of weft into position, and in close contact with the fall of the cloth. The sley is thus applied for two functions—the accurate dividing of the warp according to the 'set' of the texture, and the forcing of the shuttling-yarns into level relation with each other in the weaving of the piece.

Horizontal-warp Loom: Treadle System.—This, in its simplest form of construction, is the treadle mounting, sketched in fig. 2. The loom is composed of the chain-beam B, the warp-roll friction-

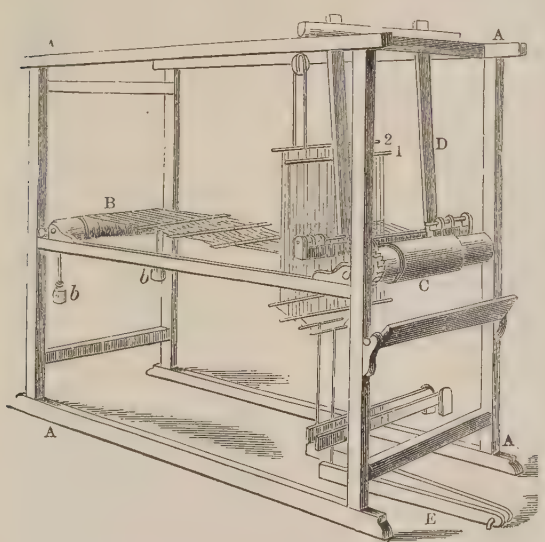


Fig. 2.

band and weight *b*, the piece-roll or beam C, the batten D, and of the treadles E, corded to the levers underneath the warp, which displace, by the short cords shown, the heddles in the operation of shedding.

For effecting the consecutive elevation and depression of the heald-shafts, a strap is fastened to the upper stave of the front heddle and carried over the pulley (seen in the illustration) to the upper stave of the back heddle to which it is connected; hence, when the weaver presses down the right treadle, heddle 1 is lowered and heddle 2 lifted; and *vice versâ* with the operation of the left treadle, heddle 2 is depressed and heddle 1 raised. The use of a larger series of heddles multiplies the parts of the mounting—e.g. in the employment of eight shafts a similar number of treadles becomes essential. That is not all. The levers under the heddles require to be duplicated or arranged in two sets, and a third lot of levers, in addition to the treadles, need to be placed on the framework of the loom and over the heddles. Each treadle, in such a scheme, is corded, first, to the 'long levers' fixed immediately above them; and, second, to the 'short levers' fixed immediately below the heald-shafts. Further, the top or 'jack' levers are secured to the long levers at their outside ends, and to the shafts of the healds at their inside ends. Each treadle commands the working of the complete set of heddles, the treadle-cords, 'long' and 'short,' being arranged thereon in the order in which the shafts require to be raised and lowered in the shedding of the warp. Though this manual system has been superseded in the fancy branches of the industry by improved mechanical motions, it is still adopted in the hand-weaving of homespuns and elementary grades of fabrics, economic cost and simplicity being in its favour.

Dobbie and Jacquard Mechanism.—Preceding the invention of the Jacquard, the 'dobbie' or 'witch' machine was devised and constructed in the West Riding of Yorkshire, where it continued to be applied in the production of figured textiles for some years after the use of the Jacquard loom in France and in certain centres of weaving in this country. As a principle of warp-shedding it has, with that of the treadle, been accepted in the development of automatic weaving-mechanism. The machine is distinct from other parts and motions of the loom, but acts in unison with them. The rudimentary type—known as 'single-action' dobbie—possesses one row of upright wires, arranged in a 'block' or frame, across which the 'lifting-bar' or 'knife' is fixed. This frame is made to slide up and down by being bolted to a lever operated by the treadle. Numerically the 'uprights' accord with the capacity of the machine or with the heddles combined. Each upright is hooked at the upper and lower end, and is governed by a spring-wire. The bottom hooks rest on the base of the dobbie, and are corded to the top staves of the heddles. Normally all the uprights are off the lifting-bar—that is, a slight distance in the rear of it. To bring them into a relation in which they will be engaged by the bar when the block is raised by the lever, the spring-wires are pressed forward by the pegs in the 'lags.' These are thin bars of wood containing as many holes as there are wires in the machine. They are linked one with the other, and pass, in an endless chain, round the cylinder, which makes a section of a revolution for each sinking of the treadle and each picking of the shuttle. From this it will be understood that the order of lifting the shafts is determined by the plan of inserting the pegs into each lag, for the pegs press against the spring-wires, which, in turn, force the uprights over the bar lifted by the upward motion of the block. In such mechanism the shafts are, therefore, raised positively, but their depression is caused

by attaching weights or springs to their lower sections, giving rise to the term 'single-action' machine. On the other hand, in the 'double-action' dobbie the shafts are both pulled up and drawn down by lever combinations and other mechanical parts. This build of shedding motion consists of a block containing two lifting-bars, placed face to face; two rows of uprights, front and back, with their hooks inverted; one row of spring-wires, each wire imparting movement to a pair of uprights; and of a series of levers, centrally fulcrumed, fixed in a frame underneath the warp. When the loom is out of action and there are no lags on the cylinder, the hooks of the front row of uprights are a fraction of an inch from their lifting-bar; but the hooks of the back row are so stationed as to be engageable by the second bar should the block be lifted by the lever and treadle. The former uprights are directly connected to the upper parts of the healds, and are for lifting functions. The succeeding row of uprights, being secured by steamer-bands to the levers below the yarn-line, and such levers being at their opposite ends fastened to the healds, result, when raised, in sinking the heddles. With a peg in the lag facing the spring-wire of upright No. 1, it is lifted by the bar on raising the block, and elevates the first shaft; and, at the same time, with a hole in the lag facing the spring-wire of upright No. 2, it is lifted by the supplementary bar, and lowers the second heddle. The effect of upright No. 2 is traceable to the steamer-band communication of the back series of wires with the levers under the healds or shedding units. One pair of levers is made, in this instance, to rise at the point of attachment and to fall at the reverse end and where corded to the lower portion of the heald-shaft. The two descriptions of movement here illustrated are applicable to the working of each front and back 'uprights' in the machine.

By this ingenious scheme of shedding, which has its counter-motions in the power-loom dobbie, the hand-loom may be mounted with 16, 24, 32, 36, or 48 shedding-units, and, before the introduction of the Jacquard, with as many as 96 or 120. It therefore offers a reasonable latitude in pattern-work. Another feature in its favour, especially where mechanically adapted to automatic weaving, is the formation of the shed by an equal displacement, up or down, of the warp-threads. In this it differs from the Jacquard as originally devised, and as still largely constructed, in which the threads are merely raised in dividing or opening the warp for the crossing of the shuttle.

The Jacquard machine or harness loom is, however, the approved and distinctive invention for establishing the changes in the positions of the warp-yarns in the production of figured and decorative textures. Strictly it is the result of the combined effort of Falcon, Vaucanson, and of the inventor whose name it bears. In 1728 Falcon originated a machine for dispensing with the labour of the assistant weaver in operating the 'tail' cords of the harness of the draw-loom. He appears to have failed in connecting his mechanism, in an efficient manner, with the harness part of the loom, though using perforated cards for the development and repetition of the pattern. Vaucanson in 1744 devised an improved machine which he placed on the top of the loom framework, or in the fixation in which it is now applied, but employed a circular cylinder for bringing the cards, on which the design was perforated, into contact with the needles or cross-wires (fig. 3) for determining the 'rise' and 'fall' action of the vertical wires (B and C, fig. 4) to which the harness cords were suspended. The form of the cylinder, and the arrangement of the interior of the machine, complicated its construction and repressed its commercial applicability. Falcon's invention is exhibited in the Lyonnais museum, and that of Vaucanson in the Conservatoire des Arts et Métiers in Paris.

Jacquard's first improvement (1801) did not meet with much approbation from the technical world, only being awarded, when shown in Paris, a bronze

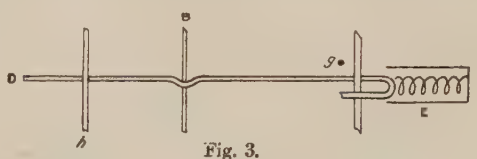


Fig. 3.

medal. His subsequent invention was so far sound in conception and principle as to have remained, in structural elements and design, practically unmodified. All three mechanicians retained, in their constructive labours, the system of harness-drafting characteristic of the draw-loom, which had for some centuries been employed in the weaving of brocades, damasks, tapestries, and other descriptions of decorative textiles.

The loom is essentially divided into two groups of units. First, the Jacquard machine for effecting the reproduction and repetition of the pattern as stamped on the cards, each prepared card coinciding with a line of weft in the weave design (e.g. s^1, s^2, &c., fig. 6) and with one throw of the shuttle. Second, the harness, which contains its irreducible number of units at the point of connection of the neck-band N with the uprights B (fig. 4). To these bands are suspended as many single cords—carrying the 'mails' through which the warp-ends are drawn, and the weights or 'lingoes' for depressing purposes—as there are possible repeats in the pattern in the width of the piece. The neck-bands thus correspond to the heddles in the treadle or dobbie loom. They receive and actuate the harness cords and mails (= healds and eyelets) from edge to edge of the fabric. The consecutive arrangement and grouping of the cords are maintained, in weaving, by being separately threaded through the holes in the 'comber' or spacing-board, which coincides in width with the reed or sley.

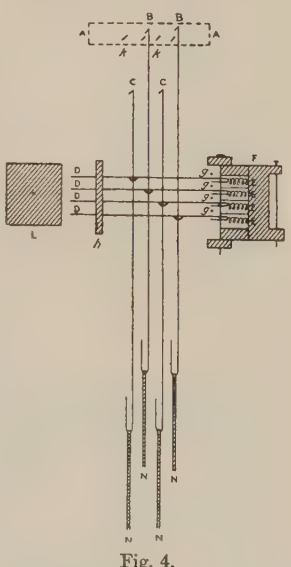


Fig. 4.

The cards, after being laced together, travel round the cylinder L (fig. 4), and are brought by the latter, working in the cylinder frame, against the needles or cross-wires, D, which pass through the needle-board, *h*. Perforations in the card enable wires D to enter the holes in the cylinder, and thus leave the uprights, as at B, B, in such positions as to be lifted by the rising action of the block A, carrying the knives or bars, *k*. Conversely, blanks in the card force the needles, D, backward, as indicated at C, C, resulting in the uprights not being raised by the lifting-pieces. On the descent of A, the metallic springs E, in the spring-box F, impel wires D

towards L, and also the uprights round which they are twisted (see wire at B in fig. 3), making the latter assume their normal or inactive positions.

Four sets of wires are represented in the sectional drawing, fig. 4, but these may be arranged in rows of eight or twelve with 24, 48, or more wires in each row. As each upright is equal to a shedding-unit, this implies that the weaving range, or capacity of the machine, is extensible to the actuation of each warp-thread individually, and throughout the whole length of the design, in which case one unit of the ornamentation woven would cover the entire surface-breadth of the fabric. For industrial activities, machines of 200, 300, 400, 600, and up to 2000 wires are constructed. This is equivalent to the manufacture of styles of figuring composed of these numbers of threads, literally unlimited in the field of shuttling, for the shots are only prescribed by the number of cards employed. It is the feasibility of thus enlarging the Jacquard apparatus indefinitely, and of operating it automatically, which renders it superior, for decorative weaving, to all other forms of warp-shedding invented.

Fabric Structure and Types.—Woven fabrics are classified, I., as to structure; and, II., as to the materials of which they are produced.

I.—Relative to structure there are four principal groups, each subdivisible into a number of textural varieties. Briefly summarised, these are as follows:

(1) Fabrics in which the warp-threads are in parallel relation, and intersected at right angles by the shots of weft, comprising the numerous kinds of cloth for wear, domestic use, and decorative application.

(2) Fabrics in which given warp-threads twist or twine round adjacent warp-threads, singly or in selected series, including gauze, leno, and similar textures with a more or less perforated surface.

(3) Fabrics having a pile, shag, curl, or looped quality, acquired in special warp or weft yarns woven on to a fine foundation cloth, as in velvets, plushes, astrakhans, carpets, corduroys, and textural imitations of natural fur.

(4) Fabrics possessing a distinctive yarn floated in pattern lines, independent of the features and texture due to the ordinary warp and weft threads, by means of frames placed in front of the reed, whose motion develops the figuring on the upper side of the cloth, as in 'lappets' made in cotton, linen, silk, &c.

II.—For the classes and types of fabrics commercially produced in the different varieties of textile fibre, and also in their admixture in manufacturing practice, see WOOL, FLAX, COTTON, SILK, and JUTE; also CARPETS and SHAWLS.

Pattern Delineation.—Pattern or design is obtained by (1) varying the structure of the cloth; (2) combining in the warp and weft several sorts and thicknesses of yarn; (3) colour blending in yarn preparation; (4) systematised arrangement of tinted yarns in the looming; (5) piece-dyeing of union fabrics in which process the different materials employed in manufacture exhibit dissimilar colouring properties; and (6) by the application of decorative principles and schemes.

Textural differentiations are primarily made by the 'weave' or plan of interlacing. Crossing the warp and weft yarns in consecutive order gives the elemental type of cloth seen in fig. 5, which, by assorting small and thick yarns in the warping and shuttling, presents a check-like character. All methods of intertexture yield distinctive builds of fabrics and distinctive surface effects. Of the basic and standardised weaves, mention may be made of the plain, twill, card, rep, sateen, mat, leno, gauze, diagonal, diamond, diaper, and honeycomb. Each forms a formula of weave construction, extension, and origination. There are, in addition, many types and classes of weave devised on two, three,

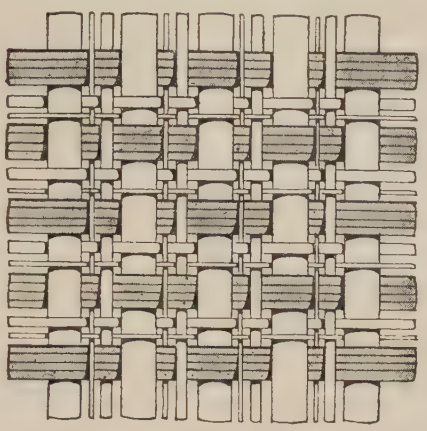


Fig. 5.

four, and up to forty-eight heddles. Fig. 6 is suggestive of the practice of transferring an 'effect' or design on to 'point' or ruled paper for the loom. The longitudinal series of squares T^1 to T^{24}, and the traverse series s^1 to s^{24}, correspond respectively to

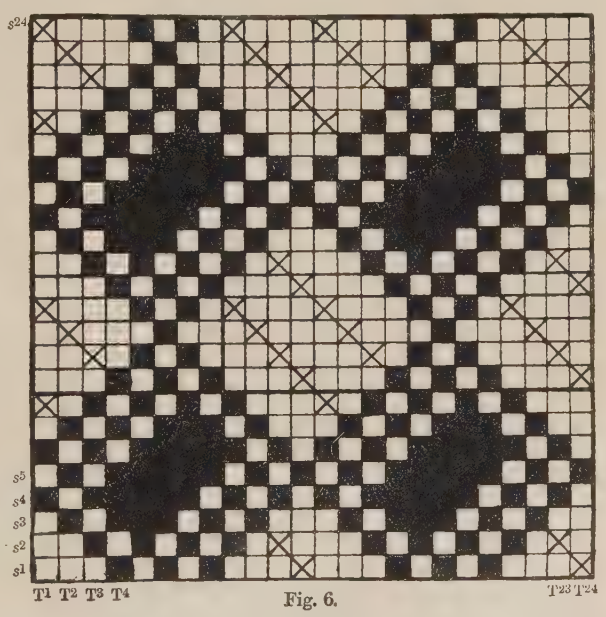


Fig. 6.

threads of warp (=heald-shafts or neck-bands in the Jacquard) and shots of weft. The marks are assumed to represent the weft, and the unmarked spaces the warp, intersections on the fabric surface. In this example the sections printed in crosses develop twilled lines, those in seriated black squares contract weft elements, and those in alternate spaces of black and white a plain-woven structure. By applying suitable compounds of such weave-units, technical pattern and decorative ornament are expressible, without the aid of tinting, in the manufactured fabric. Thus in linen damasks and

table-covers style delineation is solely a product of weave elements, and of the system of combining textural 'crossings' in working out the artist's sketch on the 'draft' or 'point' paper.

The Power-loom.—The power-loom, with the machinery for carding, combing, spinning, and finishing, is an English invention. M. de Gennes is referred to in the *Journal des Savants* as having attempted, in 1678, the construction of weaving apparatus capable of being operated by power; but this mechanism, if as indicated in the model exhibited in the Musée de Commerce, Lyons, is not to be viewed as even an initiary step in power-loom invention. Messrs R. & T. Barber patented in 1774 a group of machines for preparing, spinning, and weaving wool, flax, &c., which it was anticipated would supplant manual production. But, if exception is made to the cam-and-cam picking device of these engineers, there is not an elemental detail of their labour that has lived in the design and improvement of either weaving or other forms of textile mechanism. Cartwright, following a premature effort based on the vertical-warp loom, singled out the type of loom in fig. 2, and originated therefrom a weaving-machine for acquiring, in automatic as in hand practice, the same sequence and efficiency of motions, including (1) treadle-shedding; (2) shuttling by pickers and picking-levers (the invention of Kaye in 1733, and termed the 'fly-shuttle'); and (3) the beating up of the weft by the movement of the batten. The fundamental and controlling factor of the whole invention consisted in the substitution of a propelling or primary shaft for the labour of the weaver. This shaft, cranked in two positions of its length, and when linked by crank-arms to the going-part, extended from one side of the loom to the other. From its rotations, derived by cog-wheel gearing from the motive-source, the treadles, in communication with the heddles as in fig. 2, were depressed in successive order by cams or tappets; the batten was forced onwards and removed from the cloth; the picking-arms were alternately actuated by eccentrics and impelled the shuttle from side to side of the race. Later, warp and weft stop appliances were added for arresting the working of the loom on the breakage of either kind of yarn. The patent records reveal the fact, however, that Cartwright strictly confined his inventions to the use of two shedding-units—that is, to plain-fabric weaving. It should be observed that the modern power-loom of British, Continental, or American design embodies the master principles formulated by Cartwright. They have undergone a number of improvements, been amplified in detail and in efficiency, especially in the application to dobbie and Jacquard shedding-motions, but they remain the essential mechanical features in all types of present-day automatic weaving machinery. The field for inventive effort and research in weaving mechanism has hitherto been unscientifically developed. What has been achieved has too largely been formulated and built on inadequate forms of mechanical construction. To consider the fundamental motion in weaving, namely, warp-shedding, many of the patented improvements are mere modifications or elaborations of preceding types. The heddles have continued to be attached, as in the original hand-looms, by flexible means such as cords and straps to the shedding leases whether 'tappet' or 'dobbie' operated. This involves the heddles being connected at their upper and lower portions to the positively-actuated leases of the loom, and, in so doing, prevents real advance in shedding devices. Corresponding relics of the past exist in the shuttling and picking arrangements. Non-positive gearing is combined with positive mechanical motions. With the elimination of flexible and like means of control, and the substitution therefor of positive control of all the motions in weaving, there is ample scope for remodelling the design and construction of the whole loom on scientific engineering lines.

Production.—Trade production in the textile industries is measured and governed by the loom output. The running speeds of looms engaged in different widths of fabrics average: narrow-width goods (30 to 40 in. reed-space, cotton, linen, silk, &c.), 160 to 200 shots per minute; wide fabrics (72 to 80 in. reed-space, worsted, 56 in. finished), 100 to 120 shots per minute; wide fabrics (90 to 120 in. reed-space, woollens, 56 in. finished), 80 to 95 shots per minute; blankets, rugs, felts (140 to 180 in. reed-space), 60 to 80 shots per minute; small-ware fabrics and ribbon (60 to 80 heads), 50 to 60 shots per minute.

Output on plain goods is augmented when mechanism is applied for maintaining a supply of weft-yarn without stopping the loom. One practice (Northrop) is to change the bobbin, ejecting the spent spool from the shuttle and refilling it with a new spool and threading up the weft automatically; and a second practice (Hattersley and other makers) consists in removing a shuttle from which the weft-yarn ceases to be delivered, and of replacing it mechanically by a charged shuttle. Both systems are largely adopted, and enable a weaver with a helper to mind from six to twenty looms, according to the equality and simplicity of the class of pieces manufactured.

See Ashenhurst's *Practical Weaving* (1895); Beaumont's *Woollen and Worsted* (3d ed. 1919), *Colour in Woven Design* (2d ed. 1912), *Union Textile Fabrication* (1919), and *Standard Cloths: Structure and Manufacture* (1916); Fox's *Weaving Mechanism* (revised ed. 1900); Posselt's *Technology of Textile Design* (1895); Gand's *Cours de Tissage;* Nisbet's *Grammar of Textile Design* (1906); Beaumont and Hill's *Dress, Blouse, and Costume Cloths* (1921).

Webb, Sir Aston, G.C.V.O., architect, son of Edward Webb, engraver and water-colour painter, was born in London, 22d May 1849. He became president of the Architectural Association (1884), of the Royal Institute of British Architects (1902–4), was knighted in 1904, and was elected A.R.A. (1899), R.A. (1903), and in 1919 P.R.A.—an unusual distinction for an architect. He resigned the presidency in 1924. His works include the new front of Buckingham Palace, the Admiralty Arch, and the completion of the Victoria and Albert Museum.

Webb, Beatrice and Sidney, writers on social questions, married in 1892.—Mrs Webb (Beatrice Potter), born in 1858, wrote on the co-operative movement, the Factory Acts, and women's wages; and was a member of many government committees, including the Poor Law and Unemployment Commission. Her husband, born in London in 1859, was a clerk in the civil service, a member of London County Council, a lecturer in economics, and honorary professor of public administration in the university of London, of whose school of economics and political science he was a founder. He served on many commissions, wrote on socialism and labour questions, was prominent in the Fabian Society, and started *The New Statesman* (1913). The Webbs set up a sort of socialist *salon*, and wrote jointly *A History of Trade Unionism* (revised 1920), *Industrial Democracy*, *English Local Government*, *The History of Liquor Licensing*, the Minority Report of the Poor Law Commission (1909), *A Constitution for the Socialist Commonwealth of Great Britain* (1920), and other works. Labour member for Seaham (Durham) from 1922, Sidney Webb was President of the Board of Trade in Mr MacDonald's government (1924). See

Socialism, and Beatrice Webb, *My Apprenticeship* (1926).

Webb, Daniel, critic, was born at Maidstown, County Limerick, about 1719, studied at New College, Oxford, and lived at Bath. Besides his *Remarks on the Beauties of Poetry* (1762), reprinted in Dr Hans Hecht's *Daniel Webb* (Hamburg, 1920), he wrote on painting and on music. Webb 'of Bath,' as he is called, shows a remarkably subtle critical insight for his time, and was a precursor of the romantics. He died in 1798.

Webb, Matthew, born at Dawley, in Shropshire, 18th January 1848, became a sea-captain in 1875, and thereafter a professional swimmer. He swam from Dover to Calais in less than twenty-two hours in August 1875, and on 24th July 1883 was drowned in an attempt to swim the rapids below Niagara Falls.

Webbe, William, critic, studied at St John's College, Cambridge, and was tutor in Essex families. A friend and admirer of Edmund Spenser, he followed him only in his wayward theory of the superiority of classical to modern verse-forms, which he attempted to naturalise. His *Discourse of English Poetry* (1586) is useful for its allusions to contemporaries and for the history of English criticism.

Weber, Carl Maria Friedrich Ernst von, composer and pianist (1786–1826), came of a noble Austrian family whose musical proclivities seem to have grown with the decay of fortune. His father, Franz Anton von Weber, who began life as a soldier, excelled in violin-playing; likewise his uncle Fridolin, whose daughter Constanze became the wife of Mozart. Well advanced in a chequered career, Franz Anton married at Vienna in 1785 his second wife, Genovefa von Brenner, a singer of reputation. Returning thence to Eutin, near Lübeck, where but lately he had been Kapellmeister, he was glad to accept the humbler post of director of the town band. Carl Maria was born December 18 (?), 1786; and soon afterwards the restless father finally left Eutin with his wife and boy to wander from town to town at the head of a small dramatic company. The child was afflicted with hip-disease; but as soon as he could sit at the piano he was industriously plied with music lessons in the hope that he might rival the wonders of Mozart's early childhood. Other subjects were not neglected; and if his father's occupation conduced little to solid progress, the boy at least enjoyed endless opportunities of acquainting himself with the details of stage management. Carl Maria's serious training began in 1796 under Heuschkel of Hildburghausen, with whom he laid the foundations of his future skill at the keyboard. At Salzburg in 1798 he was taught by Michael Haydn and (now motherless) at Munich by Kalcher, to whose instructions in composition and pianoforte-playing were added singing lessons with Valesi. His very early productions young Weber for the most part destroyed; but portions of his second opera, *Das Waldmädchen*, written and produced at Freiberg before he was fourteen, he afterwards incorporated in *Silvana*, a work of greater maturity.

At Vienna in 1803 Carl Maria was warmly welcomed as a pupil by the Abbé Vogler, who obtained for him the conductorship of the opera at Breslau. This post Weber held for two years, adding to his already intimate knowledge of matters theatrical, and giving evidence of rare talent for organisation. As orchestral conductor he displayed powers truly surprising in one of his years, while he increased his mastery of the pianoforte to the highest pitch of excellence. On the other hand, Weber was oppressed by pecuniary difficulties. His salary was hardly £90 a year, his mode of life careless, and his father dependent upon him. To make matters worse, an accidental draught of poison imperilled his life and ruined his fine voice. Soon after his recovery he left Breslau at the invitation of Duke Eugene of Württemberg for Schloss Carlsruhe, where he passed some happy months devoted to composition and the direction of the duke's band. His host subsequently had him appointed secretary to his brother, Duke Ludwig, at Stuttgart; but the position entailed many duties and pleasures sadly detrimental to his artistic development. Weber's plight soon became even worse than at Breslau, and at last his career in Stuttgart was brought to a tragic conclusion. During a rehearsal of his opera *Silvana* he was arrested on a charge of fraud. His innocence was clearly proved; banishment, nevertheless, followed on February 26, 1810. The injustice acted as a tonic, and was the means of restoring Weber to his proper domain.

The next twelve months he spent at Mannheim and Darmstadt in familiar converse with Vogler and his friends Gausbächer and Meyerbeer, composing meantime the operetta *Abu Hassan*. Three concertos were written at Munich in 1811 for Baerman, the celebrated clarinettist, with whom he made a lengthened concert tour, the news of his father's death reaching him in Berlin. Early in 1813 he settled at Prague as Kapellmeister of the opera, charged by the manager with the entire reorganisation of the company, and well repaid by the complete success of his administration. During a visit to Gotha he composed two magnificent patriotic songs to words from Körner's *Leier und Schwert*, and eventually eight others. Later, the victory of Waterloo inspired him with the cantata *Kampf und Sieg*, performed December 22, 1815.

In 1816, having resigned his post at Prague, he was invited by the king of Saxony to undertake the direction of the German opera at Dresden. The venture was an entirely new one, Italian opera having been so far in undisputed possession. Weber began by taking the local amateurs into his confidence through the medium of the press, explaining the object he had in view and the conditions necessary to success. He had to organise an efficient chorus and (more difficult task) to engage his leading artists. The orchestra, too, needed some reform. All this was not easily done; but tact, combined with theatrical omniscience, soon won for the new director the loyal co-operation of his staff and the admiration of all save the partisans of Morlacchi, the Italian Kapellmeister. After a few months Weber's appointment was confirmed for life, and to his other duties he was called upon to add the frequent direction of the music at the Chapel Royal. On November 4, 1817, he was happily married at Prague to Carolina Brandt, the famous singer. In 1818 he wrote his Mass in E flat, the Jubel cantata and overture, and the Mass in G for the royal golden wedding in 1819. *Der Freischütz*, begun in 1817, was not complete till May 1820. The applause which greeted its production at Berlin, on June 18, 1821, was echoed in other places; in London it was played simultaneously at three theatres. Friedrich Kind, who wrote the libretto, having chosen to quarrel with Weber, he accepted for his next opera, *Euryanthe*, the literary co-operation of Frau Helmina von Chezy. The work was produced at Vienna, October 25, 1823, the first three performances, conducted by the composer, being enthusiastically received; but it did not long survive his departure. In Dresden, Leipzig, and Berlin *Euryanthe* met with the appreciation due to the grandest of Weber's dramatic creations.

But his disappointment at the comparative failure of the effort into which he had put his whole strength occasioned a long period of depres-

sion, from which he roused himself only to write his final masterpiece, *Oberon*, undertaken at the request of Charles Kemble for Covent Garden Theatre. The subject was chosen by Weber himself, and the English libretto written by J. R. Planché. Kemble's offer of £1000 doubtless weighed with the composer, now nearing his end and anxious for the future of his wife and family. But it was far from being his only consideration. So determined was he to do his best that, ill as he was, he took more than 150 lessons in English. March 1826 saw Weber in London, the guest of Sir George Smart, and busy with rehearsals at Covent Garden. The first performance of *Oberon* on April 12 was the crowning triumph of his life. During the next few weeks he conducted frequently at the theatre and played at many concerts. Such labour proved too much for his exhausted frame. He died during the night of June 4, and was buried at St Mary's, Moorfields, whence in 1844 his remains were removed to Dresden.

Weber has a special claim to fame as founder of German romantic opera. In this he was the direct forerunner of Richard Wagner, whose principles he anticipated by writing music thoroughly in harmony with the character of the personages and incidents represented, and by partly adopting the system of *Leitmotifs*. More or less tentatively exemplified in *Der Freischütz*, the conditions are fully carried out in *Euryanthe*, where dramatic recitative and declamation take the place of the spoken dialogue of its predecessor. Perhaps Weber's imaginative power and feeling for orchestral colour find their fullest scope in the brilliant overtures to his operas.

Besides the works already mentioned he composed some earlier operas, the music to *Preciosa*, the overture *Beherrscher der Geister*, two symphonies, three concertos (including the Concertstück in F minor), several sonatas, &c. for the pianoforte, as well as a goodly number of scenas, dramatic pieces, cantatas, and songs, for a summary of which the reader is referred to Spitta's excellent article in Grove's *Dictionary of Music*. Weber's literary, critical, and other writings were edited in 1908, and his letters in 1911, both by Kaiser; his son, M. M. von Weber, published a standard life (3 vols. 1864–66; new ed. 1912; Eng. trans. 1865), and his pupil, Sir Julius Benedict, an interesting sketch (1881; new ed. 1913); see also works in German by Jähns (1873), Reissmann (1882), Gehrmann (1899), Schmid (1922), in French by Servières (1907). See also OPERA, and the books there cited.

Weber, ERNST HEINRICH, physiologist (1795–1878), was from 1818 till his death professor of Anatomy and of Physiology at Leipzig. He was specially distinguished for his researches on the senses. For the law named after him, 'Weber's law,' see PSYCHOLOGY.—WILHELM EDUARD WEBER, physicist (1804–91), was the brother of the preceding, and in 1831 became professor of Physics at Göttingen. He was one of the seven professors deposed in 1837 for their protest against the revocation by the king of the liberal constitution. Associated with Gauss in his researches, he was specially distinguished for his contributions to electricity and magnetism. See the monograph by Riecke (1892).

Weber, GEORG, historian (1808–88), was from 1848 to 1872 director of the Bürgerschule in Heidelberg, and wrote a long series of historical works, including a universal history (15 vols. 1857–80; 2d ed. 1882–90) and a manual of universal history (21st ed. 1900).

Webster, a manufacturing town of Massachusetts, 16 miles S. of Worcester; pop. 13,000.

Webster, DANIEL, statesman and orator, was born at Salisbury, New Hampshire, 18th January 1782. His father, a farmer of Scottish stock, was a member of the state legislature and a county judge. Daniel entered Dartmouth College in 1797, poorly prepared, but soon impressed his teachers with his remarkable power of acquiring what interested him and his fluent eloquence. He graduated in 1801, studied law at Salisbury and Boston, was admitted to the bar in 1805, and quickly rose into notice at Portsmouth, the chief town of his state. Political discussion also enlisted his energies, and with the New England Federalists he opposed the second war with Great Britain. Sent to congress in 1813, he served two terms, maintaining an honourable position in an unpopular party. In 1816 he removed to Boston, where he soon became prominent as an advocate. Having been admitted to the bar of the United States Supreme Court, he established his forensic fame by the Dartmouth College case, which formed an era in the interpretation of constitutional law. The New Hampshire Supreme Court had sustained the legislature in an attempt to remodel the college; but in 1818 Webster, by a great speech, moved Chief Justice Marshall to reverse that decision, and it was declared that the original royal charter of Dartmouth, in spite of the change of sovereignty consequent upon American independence, was still a contract which could not be impaired without violating the national constitution. In the field of popular eloquence Webster's fame was first made national by his oration on the 200th anniversary of the landing of the Pilgrims—an effort which was surpassed by his address at the laying of the corner-stone of the Bunker Hill monument, 17th June 1825, and equalled by his eulogy on Adams and Jefferson in August 1826.

Returning to congress in December 1823 as a representative from Massachusetts, Webster found few rivals. Henry Clay, then Speaker of the House, made him chairman of the judiciary committee. His speech on the Greek revolution, delivered in January 1824, and translated into most European languages, extended his fame still more widely. It was the first expression of his conception of the grand destiny of the United States. After rendering important services in the House of Representatives, Webster was in June 1827 transferred to the senate, the scene of his greatest triumphs. In the early part of his congressional career he had favoured free trade and opposed the policy of protection. But in 1828 he gave his adhesion to Clay's 'American system,' and vigorously defended the new protective tariff. His reason for the change was that the people of New England, adapting themselves to the policy imposed on them by the previous action of the Federal government, had established manufactures, and that it was now the duty of the government to respect and uphold vested interests. Webster's whole career was marked by a deep reverence for established institutions and accomplished facts. The principle of nationality, the dominant passion of his mind, was fully manifested in his prompt and thrilling reply to Senator R. Y. Hayne of South Carolina, who had in January 1830 attacked New England as opposing the growth of the Union. After repelling personal assaults and the slanders on his native section, he exposed the fallacy of nullification, and portrayed with matchless skill an ideal of the Union, which deeply impressed the hearts of the people, and became thenceforth a potent factor in the national life.

Benton describes Webster as then 'the colossal figure on the political stage;' he was courted by President Jackson, whom he was destined soon to oppose stoutly; he was rivalled only by Clay and Calhoun, above whom he towered in intellect, but before whom he was deficient in will-power; and in the crisis 'will more than intellect was to rule.' After wearisome years of opposition the Whig

party triumphed in 1840, and Webster was called into President Harrison's cabinet as Secretary of State. Harrison died a month later, and his successor, Tyler (q.v.), changed the policy of the administration. Four of the secretaries resigned, and Webster was criticised and denounced by his own party for remaining. His persistence was justified by the successful negotiation of the Ashburton treaty with Great Britain. When this protracted business was finally settled he resigned in May 1843. In 1844 Webster refused his party's nomination for president and supported Clay, who was, however, defeated by Polk. In 1845 Webster returned to the senate. He assisted in averting a threatened war with England over the north-western boundary, which was fixed on the parallel of 49° suggested by him. His speech in defence of the Ashburton treaty in 1846 contained also answers to personal attacks on himself as being in the pay of New England manufacturers. The truth is that, being careless in money matters and lavish in expenses, he had accepted assistance from political friends, but he was entirely free from corruption or defalcation. The leading event of Polk's administration was the war with Mexico, which Webster opposed, as he did also any acquisition of territory by conquest. The war gave the Whig party its next candidate for the presidency, General Taylor. Webster bitterly declared the nomination 'one not fit to be made,' and refused the second place on the ticket. Yet he advised his friends to vote for Taylor, who was elected.

The question of slavery, which had long been agitated, now became the all-absorbing problem. Webster had held the prevalent Northern view that slavery was, under the constitution, a matter of domestic policy, left with the states, not to be interfered with by the general government. He deprecated the annexation of Texas and the extension of slavery, but he rebuked the formation of the Free Soil party, and in 1850, after expressing his approval of Clay's compromise, he wrote that he abhorred slavery, but was unwilling to break up the Union to abolish it. His final position was declared in his speech of the 7th March 1850, in which, after a dispassionate review of the history of slavery, he detailed the grievances of both North and South, giving emphasis and sympathy to the latter. His Northern friends were dismayed, while the Abolitionists were enraged. Whittier gave voice to a deep popular feeling in his *Ichabod*. Webster had come to regard slavery as one of the vested interests of the American nation. He had now lost his controlling influence in Massachusetts; but he was still a factor in national politics. After President Taylor's death in July 1850 Fillmore called him to his former post as Secretary of State, where again there were differences with England to settle—a protectorate in Honduras and disputes about the fisheries. Webster was deeply disappointed at not receiving the Whig nomination for the presidency in 1852. His health and spirits gave way, and he was obliged to retire from Washington to his home at Marshfield, Massachusetts, where he died on 24th October 1852.

Webster was the greatest of American orators. He was of large frame, and his brain greatly exceeded the average weight. His dark face, otherwise heavy, was lighted by large expressive eyes. His voice was of matchless compass, his utterance deliberate. Good taste, good sense, and an unrivalled gift of arrangement and style supported his glowing eloquence. The imposing dignity of his manner often rose to majesty, and he was called by his admirers 'the godlike Daniel.' As a secretary of state he was admirably qualified; his mighty memory and his power of working hard when he chose fitted him to deal with complicated international questions as they arose. But his statesmanship was throughout marked and limited by his reluctance to interfere with established institutions. His lasting service to his country was as the apostle of nationality. It must be admitted that his moral character deteriorated under adulation and the disappointment of his most cherished ambition. Had his conscience matched his intellect he would have taken a nobler position on the question of slavery, and might have attained the first rank among American statesmen. Dreading innovation, he was content to be known as 'the great expounder of the constitution.'

Webster's *Speeches, Forensic Arguments, and Diplomatic Papers* were published in six volumes (1851); his *Private Correspondence* in two volumes (1857). See the Lives by G. T. Curtis (1869), Henry Cabot Lodge (1884), and N. Hapgood (1899); and *The True Daniel Webster* by S. G. Fisher (1912).

Webster, JOHN, one of the great names of English Tragedy, was alive and writing for the stage between the years 1602 and 1624. But beyond this all is conjecture; when and where he was born and died it is impossible to ascertain. Webster is described on the title-page of one of his works as a merchant-taylor; and he was long supposed, on no sufficient authority, to have been at one time clerk of St Andrews, Holborn. For his name is not on the register of that parish, nor has research elicited any sound collateral evidence on the point. That he must be confounded neither with John Webster, the author of *The Saint's Guide*, nor with John Webster of Clitheroe, the careful investigation of the Rev. Alexander Dyce, the dramatist's first editor, has made certain. Here, then, the materials of the biographer end. Himself has said, 'I rest silent in my own work.' Webster's first recorded writing was a share in *Lady Jane* and *The Two Harpies*, a pair of patch-work productions, in which Dekker, Drayton, Chettle, and others were his collaborators; both are lost. In 1604 he made some additions to the *Malcontent* of Marston. How far these went we have no means of knowing, but we may conjecturally ascribe to him the 'Induction,' a sprightly prelude to what Marston well calls his *aspera Thalia*. In 1607 were printed *The History of Sir Thomas Wyat*, a tragedy, and two comedies, entitled *Westward Ho* and *Northward Ho*, all three the joint work of Webster and Dekker. The *History* is merely remarkable for a text singularly corrupt, but the twin-companions are a notable contrast. Both are vigorous, breezy, humorous plays, interesting as documents on the manners of their day. But while *Westward Ho* is an ill-constructed combination of prose and poetry (the best of it clearly Dekker's), *Northward Ho* is symmetrical, strong in construction, and written throughout in a sturdy, homespun prose, without hint of poetry from beginning to end. Five years later came the *White Devil*, and with its publication Webster entered his kingdom, rising near the level of the greatest tragic writers of any time. Pathos, passion, truth to nature, combined with astounding art of execution, are qualities seldom if ever more consummately displayed than here. *The Duchess of Malfi*, published in 1623, is a yet more supreme achievement in tragic art. All the great qualities of the *White Devil* are revealed with a still greater perfection of poetic beauty and verbal fitness. The story too is infinitely sympathetic. Pity and terror, the tragic emotions, are wrought to their uttermost of endurance. Published in 1654, *Appius and Claudius* (by Rupert Brooke and others assigned to Heywood) has poetry, pathos, simplicity, and constructive excellence in the plot. But set beside these others it seems cold, pale, and

merely pretty, lacking, in brief, the signal qualities of Webster's best work. *The Devil's Law Case* (1623), excepting only the excellent passages quoted in Charles Lamb's *Specimens*, is disagreeable and sordid. An ode on the death of Prince Henry, with other fragments of verse (all inferior to the noble prose of his prefaces), makes up the sum of Webster's writings. In 1664 Kirkman the printer, an ignorant man and an unscrupulous, published two comedies, *The Thracian Wonder* and *A Cure for a Cuckold*, which he declared to have been written by Webster and Rowley. Kirkman's unsupported word proves nothing, and although some ingenuity has been exercised to prove Webster's paternity in the case of the former play, both actions may be unhesitatingly dismissed. In 1624 a tragedy entered as 'the recent murther of the sonn upon his mother, written by Forde and Webster,' was licensed for the stage. It is lost to us now, with how much more!

Not popular in his own day, Webster, in Swinburne's happy phrase, 'found his first recognition at the pious and fortunate hands of Charles Lamb.' Since then he has been praised to reverence by various masters of criticism, and his name claimed by enthusiastic writers as the next in tragic art to Shakespeare's. An attempt at a detailed appreciation may be spared in the case of a dramatist whom Lamb and Hazlitt have praised in imperishable sentences. But a single word may be said of Webster's limitations as these are defined in Kingsley's *Plays and Puritans*, and elsewhere. Webster is charged with the faults of Tourneur—with having a diseased view of human nature, and the art of a poet of horror and the shambles. In support of the last part of the indictment the many terrible episodes of the *White Devil* and *The Duchess* are cited. But no poet should be judged by episodes and scenes removed from their context and considered in 'a cold abstraction.' The effect produced *on the reader as he reads* is the only just test, and to examine this is the true function of the critic as the other is that of the *advocatus diaboli*. To him who reads no episode in either of Webster's masterpieces seems forced and wrong; the atmosphere is charged with horror, and each point of terror is a just and natural step towards the catastrophe. For the rest it will suffice to say that no one ever rose from Webster's pages inspired with any but a more spacious, a loftier, and a braver view of life and its issues. There are instances without end in his best work where nature seemed to take the pen and write for him. But passion and pity and terror were the emotions that transcribed their secrets for him; not cynicism and nausea. The chosen epithet of Hazlitt in this connection, echoed by Swinburne, is the last word on this dramatist: 'there is no nobler-minded poet than Webster.'

See Lamb's *Specimens*, Hazlitt's *Lectures on the Literature of Elizabeth*, Gosse's *Seventeenth Century Studies* (1883). Webster was edited by Dyce (1830), Hazlitt (1857–58), and in part by Symonds ('Mermaid Series,' 1888), and Sampson ('Belles Lettres Series,' 1905). See also Swinburne, *Studies in Prose and Poetry* (1894), and *Age of Shakespeare* (1908); Stoll, *John Webster* (vol. i. 1905); and Rupert Brooke's essay (1916).

Webster, NOAH, lexicographer, was born in Hartford, Connecticut, 16th October 1758. His studies at Yale College were interrupted by service in his father's company of militia in the war of independence, but he graduated in 1778, and thereafter took to teaching and to the study of law, being admitted to the bar in 1781. But he soon returned to teaching, and made so great a hit with the spelling-book which formed part of *A Grammatical Institute of the English Language* (3 parts, 1783–85) that for twenty years he and his family lived on its meagre royalty of less than one cent a copy. Political articles and pamphlets, lecturing, journalism at New York, a few years' prosperous practice of law at Hartford, and again journalism in a fresh venture at New York occupied his life till 1798, when he retired to a life of literary labour at New Haven. Here, with the exception of the years 1812–22 spent at Amherst, Massachusetts, he lived till his death, 28th May 1843. His *Philosophical and Practical English Grammar* appeared in 1807, and the famous *American Dictionary of the English Language* (2 vols. 4to) in 1828.

The weakest part of the dictionary was its pre-scientific and uncritical etymologies; thus Webster derived *establish* and *preach* from Hebrew. A second edition followed in two volumes (1840–41). Later editions were those by Goodrich, his son-in-law (1847); that of 1864 (Goodrich and Noah Porter) with revised etymologies; that of 1890 (Noah Porter); and that of 1910, edited by Harris and called *Webster's New International*. See the Life of Webster by Scudder (1882).

Weddell, JAMES (1787–1834), Antarctic navigator, gave his name to the Weddell Sea in the Weddell Quadrant of the Antarctic. In his principal voyage, 1822–24, he penetrated to a point about 75° S. lat. and 35° W. long., which was for long the furthest south latitude reached. See also ANTARCTIC OCEAN, POLAR EXPLORATION (with *Map*).

Wedderburn, ALEXANDER, a Lord Chancellor of England, ennobled as Lord Loughborough and Earl of Rosslyn, was born at Edinburgh, 13th February 1733, the son of a Scottish judge. He passed as advocate, but was called to the English bar in 1757. He entered parliament in 1762, took part in the great Douglas cause, and in 1771 left the opposition to become a strenuous supporter of Lord North as Solicitor-general. He supported the American war policy, and was made chief-justice as Lord Loughborough (1780); but in 1784, disappointed of the chancellorship, passed over to Fox, and curried favour with the Prince of Wales. Insinuating and unscrupulous, he next made friends with Pitt, by whom he was made Lord Chancellor (1793), but to whom he played false. Addington gave him his earldom (1801), and he died 2d January 1805.

Wedding Ceremonies doubtless arose by degrees and in different ways; and often when the mode of contracting a marriage altered, the earlier mode survived as a ceremony. Thus, for example, the system of capture was transformed into a mere symbol after purchase was introduced as the legal form of contracting a marriage, and again the custom of purchase has survived as a ceremony after it has ceased to be a reality. Marriage being a matter of some importance naturally begot ceremonial—symbolical of sexual intercourse, or of living together, or of the wife's subjection to the husband. And naturally religious rites would be added to give sanction—prayers, sacrifices to appease the gods. There was no religious contract among the ancient Hebrews, and there is no trace of priestly consecration in the Scriptures or the Talmud. Under Christianity a religious character came early to be given to the rite, although the early church, like the Buddhists, regarded marriage as little more than a concession to human weakness. The notion that marriage is a sacrament grew naturally out of St Paul's phrase, 'This is a great mystery' (Eph. v. 32), for the Vulgate translation renders *μυστήριον* by 'sacramentum.'

One of the most wide-spread rites of marriage is that of the man and woman eating out of the one dish, as we see it, for example, all over the Malay Peninsula, and elsewhere. Among the Roman

three forms of marriage prayers, sacrifices, and auspices were essential only in the *confarreatio*, not in the *coemptio* and *usus*. In the first of these, the old patrician mode, the chief ceremony was the offering of a cake of spelt, made to Jupiter in the presence of the *pontifex* and *flamen Dialis* with ten witnesses. The *coemptio* again was a symbolic sale in which the father delivered his daughter to her husband as a piece of property, she at the same time declaring her consent. In the betrothal the bridegroom gave the bride earnest-money, as in other cases of contract, or a ring in its stead. The *usus* resembled our *handfasting*, the only thing required being that the woman should live a year in the man's house without absenting herself from his bed for three nights.

Our modern 'best-man' is no doubt the survival of the bridegroom's best helper in the act of capture. In the good old times there were many hearty wedding customs now considered almost as indecorous as Squire Western's jokes would be, such as the struggle for the bride's garters, the drinking of healths in the bridal chamber, the singing of boisterous and appropriate songs outside the door, and the like. The throwing of rice, not an indigenous English custom, displaced the strewing of herbs, flowers, and rushes on the way to church, to be more or less displaced in turn by pelting with confetti. The giving of garlands, gloves, and the like has fallen into disuse; but knots and favours are still used symbolic of indissolubility; and the ring and bridescake retain their place, oldest and most universal of our wedding customs. The wedding-feast was sometimes protracted for a week, and it was formerly the universal custom amongst the poor for the guests to bring contributions of all kinds in what were called *penny-weddings*, so that the young couple not only saved the expense of the feast, but had something over to begin housekeeping on. The modern custom of giving presents is a survival of a time when such were more immediately useful than they now often are. Many minor customs are observed in different corners of the kingdom, governing the whole order of procedure, and these it is necessary to respect in order to ensure success in the enterprise. Thus in Shropshire the bride must be dressed entirely in new clothes, of any colour but green, without even a pin that she had ever used before; although elsewhere it is lucky to wear something already worn by a happy bride. Often the bride's father does not go to church; the mother never does. Great pains used to be taken to select a favourable day—the importance of this we see in the dislike to May (q.v.), or again in the Bedouin preference for Friday, the Chinese for spring or the last month in the year. In olden times the actual sale of wives was not unknown in England, and we are told that the second Duke of Chandos bought his second wife in 1744 from her husband, an ostler in Newbury, who was offering her for sale as the duke passed through the town. See FAMILY, MARRIAGE, HANDFASTING, BRIDE, RING, JUS PRIMÆ NOCTIS; works by Westermarck, and Crawley's *Mystic Rose* (ed. Besterman, 1927).

Wedekind, FRANK (1864–1918), German dramatist, was born in Hanover, was educated in Switzerland, went in for journalism, and in 1897 began touring as actor-manager, principally between Munich and Berlin. His plays include *Frühlings Erwachen*. *Die Büchse der Pandora*, *Schloss Wetterstein*, and show the influence of Strindberg in the outspoken treatment of erotic problems. He also wrote poetry, novels, and essays.

Wedge, one of the mechanical powers, in principle a modification of the Inclined Plane (q.v.). The power is applied to the back of the wedge by pressure or, more usually, by percussion. Familiar examples of its use are the splitting of wood, the fastening firmly of the handle of an axe, the raising of a ship in a dry-dock, &c. Axes, nails, plugs, planes, chisels, needles, and all sharp-pointed instruments are examples of the single wedge.

Wedgwood, JOSIAH, the creator of British pottery as an art, was born at Burslem, Staffordshire, 12th July 1730. His father was a potter, and at ten he was set to work at the same business, his education being of the scantiest. After an abortive attempt to settle himself at Stoke with a partner named Harrison, in 1759 he returned to his native place, and there commenced business as a potter. From the first his ardour for the improvement of the manufacture was conspicuous. His earliest efforts were directed to the refining of the material, and in 1763 he took out a patent for a beautiful cream-coloured porcelain, which became popularly known as Queen's Ware, Queen Charlotte having much admired it, and extended her patronage to the manufacturer. Subsequently, other improved materials were produced. The attention of Wedgwood was not less assiduously directed to considerations of form and decoration; he busied himself in emulating the grace of the antique models; and the celebrated sculptor Flaxman was from 1775 employed to furnish designs for his 'Wedgwood ware'—white cameo reliefs on a blue ground and the like. In this way what he found a rude and barbarous manufacture he raised to the level of a fine art; and he found his reward in the amassing of a fortune of upwards of half a million. In 1769 he had removed his works some little way from Burslem; and to the new site he gave the fanciful name Etruria, as that of the country of old most celebrated for the beauty of its ceramic products. Here he built himself a splendid mansion; and here he died, 3d January 1795.

Apart from his eminence in the art to which he mainly devoted himself, Wedgwood was a man of considerable culture. Natural philosophy, in particular, he studied with much success. He was a fellow of the Royal Society, as also of the Society of Antiquaries; and to the *Philosophical Transactions* he from time to time contributed papers. He likewise interested himself deeply in all matters of public concernment; and mainly through his influence it was that the Grand Trunk Canal, uniting the waters of the Mersey, the Trent, and the Severn, was carried out. He was a man of much benevolence and of an almost princely liberality.

See Llewellen Jewitt, *The Wedgwoods* (1865); the Life by Eliza Meteyard (2 vols. 1860); *The Wedgwood Handbook* (1875); Burton's *Earthenware and Stoneware* (1904); F. Rathbone, *The Masterpieces of Old Wedgwood Ware* (1892–93); J. C. Wedgwood, *Staffordshire Pottery* (1913); William Burton, *Josiah Wedgwood and his Pottery* (1922); the Life by S. Smiles (1894); *The Personal Life of Josiah Wedgwood* by his great-granddaughter Julia Wedgwood, revised and edited by Professor C. H. Herford (1915); also the articles POTTERY and PORTLAND VASE.

Wedmore, a village of Somersetshire, 8 miles WNW. of Wells. Here the peace of Wedmore was signed in 879 between King Alfred (q.v.) and Guthrum the Dane. See Prof. Earle's *Peace of Wedmore* (Oxford, 1878).

Wedmore, SIR FREDERICK (1844–1921), art-critic, was born at Clifton, and educated mainly at Lausanne and Paris. He wrote on etching—*Four Masters of Etching* (1883), *Etching in England* (1895), *Whistler's Etchings* (1899), *Etchings* (1911)—on *English Art* (2 vols. 1876–80), on *Genre Painting* (1880), on Méryon, Balzac; he also published volumes of short stories—*Pastorals of France*

(1877), *Dream of Provence* (1905)—and a book of Reminiscences (1912).

Wednesbury (locally *Wedgebury*), a municipal and parliamentary borough in the south of Staffordshire, 8 miles NW. of Birmingham. Crowning a hill at the north end of the town is the cruciform Perpendicular church of St Bartholomew, supposed to occupy the site of a temple of Woden —whence the Old English name, *Wodnesbeorh*. It seems to have been built in the 11th, and rebuilt in the 15th century, and was much altered and restored between 1766 and 1885. Here, too, in 916 the Princess Ethelfleda, Edward the Elder's sister, founded a castle. Modern buildings are the town-hall (1872), public baths and free library (1878), and art gallery and museum (1891), with a collection of modern paintings, the gift of a local benefactor. One of the great iron towns of the Black Country, in a district abounding in coalpits, ironworks, railways, and canals, Wednesbury has manufactures of boiler-plates, bar-iron, steel, railway ironwork, gas and steam tubes, edge tools, &c. In 1886 it was incorporated as a municipal borough, and in 1867 was made a parliamentary borough, returning one member, and till 1885 including West Bromwich (q.v.). Pop. (1851) 11,914; (1881) 24,566; (1921) 30,407; of parliamentary borough (1921) 82,756.

Wednesday, the fourth day of the week, the *Dies Mercurii* of the Romans, the *Mittwoch* ('mid-week') of the modern Germans. The Old English form was *Wódnes dæg;* the Dutch, *Woensdag;* Swedish and Danish, *Onsdag*.

Weed, a popular name for any sudden illness, cold, or relapse with febrile symptoms in women after confinement or nursing, especially Milk-fever (q.v.) and inflammation of the Breasts (q.v.).—In horses Weed, or Shot of Grease (Lymphangitis), consists in inflammation of the large absorbent glands and vessels situated between the horse's thighs, occurring particularly after a day or two of rest, after exposure to cold, or during imperfect action of the bowels. See VACCINATION.

Weed, THURLOW, journalist, was born at Cairo, New York, November 15, 1797, was employed as a lad in several printing-offices, served as a private in the war of 1812, and afterwards edited newspapers in Western New York, until in 1830 he founded the Albany *Evening Journal*, an anti-Jackson, Whig, or Republican paper, which became the organ of the party, and which he controlled for thirty-five years. He was a leading party manager, and exercised almost supreme influence in nominations and appointments, while declining all offices for himself. In 1867–68 he was editor of the New York *Commercial Advertiser*. He died 22d November 1882. See his *Autobiography* (1882; vol. ii., by his grandson, 1884).

Weeds, the name given to all those plants which grow wild in cultivated grounds, and injure the crops; which they do both by choking them and by exhausting the soil. Those weeds which are annuals or biennials, as charlock, yellow rattle, and melilot, may gradually be got rid of by merely cultivating, for a succession of years, such plants as are to be cut before the seeds of the weeds are fully ripe. Perennial weeds, such as couch-grass, can only be removed from the ground by repeated and careful tilling; and for this purpose crops which require much hoeing are advantageously planted, and recourse is had to summer fallowing (see FALLOW) in fields, and frequent weeding in gardens. Thistles and other large weeds are frequently pulled in cornfields before the corn comes into ear, and to prevent their seeding they are cut in pastures. Sedges and rushes, which spring up in great abundance in damp grounds, disappear on thorough draining. Leafy crops which thickly cover the soil prevent the growth of many weeds by the exclusion of air and light. Weeds which have been rooted up form excellent compost for manure. Those which make their appearance in fallow grounds serve for green manuring when they are ploughed down. Cultivated grasses growing in arable fields are weeds there. The seeds of weeds are carried normally by the wind, but may be conveyed by running streams. Weeds are often sown along with crops, the seed being imperfectly cleaned; and they are often spread by manure, conveyed by the droppings of birds, or in the mud clinging to the feet of men and animals. Weeds spread far and near from ill-cleaned hedgerows. Weeds transferred to new countries sometimes grow more luxuriantly than at home; thus the Anacharis (q.v.) from America almost chokes up ditches and canals in England, and the thistle from Britain is a ruinous pest in some parts of Australia.

Week, O.E. *wicu*, from a root *wikon*, which probably means 'to change.' In its ordinary sense the term refers to a period of seven days which does not synchronise with either month or year; but it is also applied to non-European calendar units varying between three and ten days, and must then be defined as the shortest unit above the day; but even this is subject to qualification, for some tribes divide the month into decads, which are, however, not termed weeks. To define the week as non-synchronous with the month is, on the other hand, impossible, because the northern Yoruba have a five-day week synchronised with the lunar month by shortening the sixth week in the month.

Scandinavia appears to have had a five-day week at one time; but there is no record of any other European week, for it was unknown to the Greeks and not adopted by the Romans till the time of Theodosius. The week had, however, long been known in the East, among the Jews and their neighbours, and the period was chosen, in all probability, on astrologico-astronomical grounds to agree with the number of the great heavenly bodies, sun, moon, and five planets. We learn from Dio Cassius that the order of the names of the days is derived from the Egyptians, who regarded each of these seven bodies as the 'lord' of an hour, in the order Saturn, Jupiter, Mars, Sun, Venus, Mercury, Moon. It is clear that the series begins afresh with the eighth, fifteenth, and twenty-second hours; if the day began with the hour of Saturn, the next begins with the hour of the Sun, and so on; the name of the first hour of the Egyptian day is the same as the name of that day in our week, with the substitution in most cases of Germanic names.

Outside Europe the week is known in West Africa from Liberia to Kamerun and in the Congo area, with sporadic cases in East Africa; the commonest unit is four days (S. Nigeria and Congo), or eight, i.e. double-four (Kamerun in part); north of this is a five-day belt south of the Benue (with Kamerun and northern Yoruba); six- and seven-day weeks are recorded in Togoland and farther west, and three-day weeks in Togoland. There can be little doubt that the African week is economic in its origin, and due to the need for regularly recurring markets; the rest day, which is commonly observed during the week, appears to be of religious origin; but there is at present no reason for supposing that the week originated in the regularly-recurring rest day.

A five-day week has been recorded from Persia, Java, Malaysia, and New Guinea, probably originating from a single centre; it was also known in

Mexico, while in South America the Chibchas (four-day) and Muyscas (three-day) knew the week; here also an economic origin is probable.

The name week is often applied to the thirteen-day period of the Mexican *tonaltmatl*, or book of good and bad days; but it was not in essence a calendar at all but a book of divination.

Weelkes, THOMAS (*c.* 1575–1623), one of the greatest of the English madrigal composers, was organist at Winchester College (1597–1602) and then at Chichester Cathedral till his death in London. His works, which include nearly 100 madrigals, airs and ballets for 3, 4, 5, or 6 voices (as well as much ecclesiastical music), are characterised by harmonic daring, imaginative power, and rich chromatic colouring. See various books by E. H. Fellowes (1913 *et seq.*) on the Madrigal (q.v.) and madrigal composers.

Weems. See EARTH-HOUSES.

Weever, or STING-FISH, a genus of fishes (Trachinus), of which two species, the greater (*T. draco*), 12 or 13 inches long, and the smaller (*T. vipera*), are both British, and are esteemed for the table. They have a sharp, grooved, gill-cover spine with a poison-gland at its base, and the same is true of five or six spines of the anterior dorsal fin. The weevers can inflict a painful and troublesome wound if incautiously handled.

Weever, JOHN (1576–1632), author of *Epigrammes in the Oldest Cut and Newest Fashion* (1599; ed. R B. McKerrow, 1922), and of *Ancient Funerall Monuments* (1631; 3d ed. by Tooke, 1767), was a native of Lancashire, studied at Queen's College, Cambridge, and died in London.

Weevil, a popular name for a large number of beetles, marked by the prolongation of the anterior part of the head into a beak or proboscis, generally used by the females as an ovipositor, and by both sexes as a boring organ. They were formerly ranked in one family Curculionidæ, but Le Conte constituted them a special group with the title Rhynchophora, and divided them into several families—Curculionidæ, Scolytidæ, Brenthidæ, and Anthribidæ. According to some authorities there are about 30,000 species; and most would allow at least half that number. With few exceptions the footless grubs are destructive to plants. The Curculionidæ are compact weevils, with very hard wing-covers, and with a downward-pointing beak or proboscis, bearing the antennæ on its sides and the mouth-parts at its end. Their scales are often very brilliant. With few exceptions they devour plants—roots, stems, leaves, fruits, seeds, or, in fact, any part. Among the 10,000 described species are: *Calandra granaria*, whose larvæ feed on stored grain; *C. oryzæ*, attacking rice, wheat, and maize; various species of Rhynchophorus, whose large, fleshy, white larvæ, known as palm-grubs or *grugru*, are sometimes eaten; Balaninus, whose mandibles, unlike those of other beetles, move vertically, whose larvæ are hatched in chestnuts, hazel-nuts, acorns, and the like; *Trichobaris trinotata*, a little black weevil, which destroys potatoes in America; *Anthonomus pomorum*, often destroying apple-blossom in Britain; *A. grandis*, the Mexican cotton boll weevil, which has invaded the United States with dire results; *Conotrachelus nenuphar*, which lays its eggs in nectarine, plum, apricot, peach, and other stone-fruit, and is a great pest in America; *Cionus scrophulariæ*, whose larvæ spin cocoons remarkably similar to the capsules of *Scrophularia nodosa*, which the insect usually infests; Pissodes, whose larvæ attack pines; *Phytonomus punctatus*, a clover weevil, introduced from Europe into America; *Entimus imperialis*, the diamond-beetle, with very brilliant scales. Species of the likewise brilliant Rhynchites attack fruit-trees; species of Apion especially affect vetches; and those of Larinus infest Compositæ.

The Scolytidæ are very small weevils, some almost microscopic, which, both as larvæ and as adults, bore in wood and bark of trees, especially Coniferæ, and occasionally attack herbaceous plants (see BARK BEETLES). The Brenthidæ are much elongated weevils, mostly tropical, usually infesting bark, and notable for the combats of the rival males, which are larger and better armed than their mates. Brenthus and Eupsalis are representative genera. Among the Anthribidæ *Cratoparis lunatus*, common in the eastern United States, feeds on the fungi of dead trees; and the larvæ of Brachytarsus are even more aberrant in their habit, for they are parasitic on female coccus-insects. The seed-inhabiting 'weevils' or Bruchidæ do much damage to the seeds of leguminous plants, within which the larvæ hatch and pupate. Both in Europe and America *Bruchus pisi*, *B. rufimanus*, &c. are destructive to peas and beans, but the common pea-weevil in England is *Sitones lineatus*, one of the Curculionidæ.

The most important British weevils are probably the following: *Anthonomus pomorum* on apple-blossom; *Apion apricans*, &c. on clover; *Bruchus rufimanus* on bean-seed; *Hylesinus fraxini*; *Hylurgus piniperda*; species of Otiorhynchus on vines, raspberries, strawberries, &c.; *Scolytus destructor*, attacking wood and bark; *Sitones lineatus*, ruinous to peas. See Miss Ormerod's *Manual of Injurious Insects* (3d ed. 1898).

Wegener, ALFRED LOTHAR, was born at Berlin in 1880, studied at the university there, took part in investigations in Greenland 1906–8 and 1912–13, was appointed privat-dozent at Marburg in 1909, professor of Meteorology at Hamburg in 1919, and was later transferred to Graz. His chief work is *Origin of Continents and Oceans* (3d ed. 1922; Eng. trans. 1924). For his views, see GEOLOGY (*Speculative*).

Wegscheider, JULIUS AUGUST LUDWIG, rationalistic theologian (1771–1849), born at Kübbelingen in Brunswick, became professor of Theology in Hesse, and in 1810 at Halle. His chief work was the *Institutiones theologicæ dogmaticæ* (1815).

Weighing-machines, contrivances for ascertaining the weight of any object, the name being, however, specially appropriated to those used for large and heavy objects, as large bales, casks, laden carts or vehicles, cattle, &c.; while those employed for finer purposes are called balances. The large and cumbrous ones are usually modifications of the principle of the steel-yard. See BALANCE.

Weights and Measures. Of the earliest standards of length the principal were the palm or handbreadth, the foot, and the cubit (from elbow to tip of mid-finger). There were two leading cubits: the natural cubit in Egypt, Chaldea, Phœnicia, and Greece = 6 palms = 2 spans = $1\frac{1}{2}$ foot = 18·24 inches; and the royal cubit of Memphis, found also in Babylonia and Chaldea = 20·67 inches. The Greek foot (= 12·16 inches) passed into Italy and was there divided into 12 unciæ (inches); it was afterwards shortened, becoming as small as 11·65 inches. The Romans used a 3-foot *ulna*. The Saxons used an ell or yard of 36 inches, based on the Roman foot. This was continued by the Normans in England, various modifications occurring in the ell. Henry VII. and Elizabeth made standard yards of 36 inches: Henry's was 35·963 inches of the present standard; Elizabeth's was about $\frac{1}{10}$ inch short of the present yard. In 1742 the Royal Society of London made a standard 42-inch scale; in 1760 Mr Bird made for a Weights and Measures Committee of the

House of Commons a copy of an old yard-measure found in the Tower. In 1824 (5 Geo. IV. chap. 74) this copy was legalised as the standard yard, with the direction that in the event of its being lost, the standard was to be recovered by making the length of a mean-time seconds pendulum in the latitude of London, in a vacuum at sea-level, equal to 39·1393 inches. In 1834 the standard was destroyed in the fire at the Houses of Parliament. In 1838 a committee was appointed under Mr Airy, astronomer-royal; in 1841 they reported against the accuracy of the pendulum-method; in 1843 they were appointed as a commission to restore the lost standards; this they did between 1843 and 1854 by taking the best secondary evidence, and they produced a standard bar of gun-metal, the distance between two lines on which, crossing two gold studs, is one yard at 62° F. and 30 inch bar. pressure. This was legalised as the standard by 18 and 19 Vict. chap. 72. Parliamentary copies are lodged at the Mint, the Royal Observatory, Greenwich, with the Royal Society of London, and immured in the parliament buildings, Westminster; while copies have been supplied to many towns. The Weights and Measures Act of 1878 (41 and 42 Vict. chap. 49) regulates the law, renders all old local or customary weights and measures, other than imperial ones, illegal, and enacts penalties on false and unverified weights and measures varying from £5 to £50. The use of the metric system of weights and measures was, however, legalised for the United Kingdom by 60 and 61 Vict. chap. 46, 1897, and Orders in Council 19th May 1898 (Statutory Rules and Orders Nos. 410 and 411, 1898); the spelling adopted was 'kilogram' and 'gramme,' it being felt that the spelling 'gram' would be dangerously liable to be mistaken for 'grain' in MS.

Two-thirds of a cubit, we have seen, made a 'foot;' a cubic 'foot' of water weighed a talent. When the 'foot' was $\frac{2}{3}$ the royal cubit, the talent was 655,566 grains; this was the Egyptian, Hebrew, and Olympic monetary talent, later known as the great Alexandrian talent of brass and the Egypto-Roman talent. A talent half this weight was known as the Alexandrian talent of silver, or 327,783 grains; this was divided into 60 minas of 5463 grains each; these are the origin of the Saxon moneyer's lb. of 5400 grains = Mint lb. or Tower lb. = old apothecaries lb. of Germany; one such lb., in silver coins, was the original form of 'one £ sterling,' and was divided into 20 'shillings,' or 240 'pence' or pennyweights; each dwt. was divided into 32 monetary grains (wheat-grains), each equal to 0·703125 modern grain. The Tower weight was abolished in 1527. The Saxon ounce contained 416·5 grains = nearly, Roman uncia = $\frac{1}{12}$ libra; the libra (= 5015 grains) was the Greek-Asiatic and Persian mina of 5015 grains. The Troy lb. is 5760 grains = 12 oz. of 20 dwt. each. Troy weight is now restricted to gold, silver, and jewels, except diamonds and pearls; the latter are weighed in carats (= 3·1683 grains), which were originally $\frac{1}{144}$ the Alexandrian ounce (the twelfth part of the mina of silver). Various larger lbs. were early used for merchandise; in 1303 the 'avoirdupois' lb. (= 7000 grains) was in use. The Troy lb. standard made by Mr Bird in 1758 for the Weights and Measures Committee was legalised in 1824; in 1834 the standard was destroyed; the Standards Commission replaced troy weight by avoirdupois, and the standard lb. is a mass of platinum weighing 7000 grains *in vacuo*, copies of which are distributed as in the case of standards of length. The standard of capacity is the gallon, which was in 1824 adjusted so as to contain 70,000 grains, or 10 lb. avoirdupois of water at 62° F. and 30 inches bar. pressure; this gallon occupying 277·274 cubic inches, instead of the old Winchester gallon of 274¼ cubic inches. The French or Metric system of weights and measures is based on the Decimal System (q.v.); and see METRE, ARE, GRAMME, LITRE.

See Chisholm's *Weighing and Measuring*, Kelly's *Universal Cambist*, Tate's *Modern Cambist*, Whiteley's *Law of Weights and Measures*, Ridgeway's *Origin of Metallic Currency and Weight Standards* (1892); the articles on the various measures; also AVOIRDUPOIS, DEGREE, GRADUATION, TROY WEIGHT, UNITS, &c.

Wei-hai-wei, a naval and coaling station in the east of the province of Shantung, China, leased with some adjoining territory and with the islands in the bay to Great Britain by China in 1898. Wei-hai-wei is administered by a commissioner, the seat of government being at Port Edward, on the mainland. The territory is hilly and picturesque, the climate excellent; the soil is fertile, and cereals, vegetables, and fruits are grown, while ground-nut kernels, ground-nut oil, salt, sugar, fish are exported. It is a duty-free port. As a result of the Washington Conference (1922), the restoration of Wei-hai-wei to China has been discussed. Area, 285 sq. m.; pop. (1921) 154,416.

Weil, GUSTAV, orientalist (1808–89), was of Jewish descent. He studied in Germany, Paris, and the East, and became (1838) librarian and (1861) professor of Oriental Languages at Heidelberg. His chief works are a Life of Mohammed from Arabic sources (1843), histories of the khalifs (1846–62) and of the Islamitic peoples (1866), &c.

Weimar, an interesting town of Germany, capital (since 1920) of Thuringia, formerly of Saxe-Weimar-Eisenach, 31 miles E. of Gotha and 155 SW. of Berlin. It stands in a pleasant valley on the left bank of the Ilm; but the environs are in no way remarkable, and the town itself is irregularly and rather poorly built. Weimar carries on neither trade nor manufactures, and seems a dull, provincial-looking town. The lustre conferred on it by the residence, at the close of the 18th and the earlier portion of the 19th century, of Goethe, Schiller, Herder, and Wieland, at the court of Karl-August (1757–1828), faded after that group was broken up by death; and now the interest of the place (Thackeray's 'Pumpernickel') is mainly derived from its monuments, traditions, and associations. The town church (*Stadtkirche*), begun in 1498 and rebuilt 1726–35, has a 'Crucifixion' by the elder Cranach, and contains a number of memorable tombs, among which are those of Lucas Cranach, Duke Bernhard of Weimar, and Herder. The ducal palace, rebuilt in 1790–1803 after the fire of 1774, the south wing being added in 1914, is a handsome building with interesting art treasures; some of the apartments are decorated by frescoes illustrating the works of Goethe, Schiller, Herder, and Wieland. Goethe's house, built in 1709, altered in 1794, was restored in 1908 as far as possible to its condition during the life-time of the poet, and contains now a large number of Goethe relics, but the Goethe and Schiller Archives are kept in another building. Other buildings are the Rotes Schloss (1574); the Grünes Schloss, with a great library and a valuable collection of coins and medals; the state museum, comprising a picture gallery with mural paintings by Preller; the theatre (rebuilt 1907), where Liszt (who lived a good deal at Weimar) produced Wagner's *Lohengrin*, and where the National Assembly in 1919 drew up the German republican constitution; the Belvedere palace (1724–32), opened in 1923 as a Rococo museum; and the houses of Liszt and Schiller. The park and gardens of the palace, within which is the summer residence of Goethe, are much esteemed as a promenade. Pop. (1871) 15,998; (1910) 34,582; (1925) 45,957.

Weingartner, Felix, conductor, composer, pianist, and critic, was born at Zara, Dalmatia, in 1863, and studied at Leipzig Conservatorium (1881–83) and then under Liszt. He is a brilliant conductor, and in this capacity has held official posts at Berlin, Munich, Vienna, &c., and has toured in Europe and the United States. His compositions —5 symphonies, several operas all to original texts, and much chamber music—are scholarly without being individual. His literary works include *Beethoven's Symphonies* (1906), *The Symphony after Beethoven* (3d ed. 1909), *On Conducting* (4th ed. 1913)—all three translation into English—some plays, and a volume of recollections (1923).

Weir, Harrison William, book-illustrator, painter, and wood-engraver, was born at Lewes on the 5th May 1824. From about 1845 he exhibited at the Royal Academy and elsewhere pictures of birds and animals. But he is best known by his drawings and wood-engravings in periodicals; in various books of natural history and poultry; and in a series of works written by himself, *Animal Stories*, *Bird Stories*, and *Our Cats*. He died 3d January 1906.

Weishaupt. See Illuminati.

Weismann, August (1834–1914), biologist, was born at Frankfort-on-the-Main, in the lyceum of which city his father was professor of Philology. He was educated at the gymnasium till his eighteenth year, studied medicine at Göttingen, and in 1860 became physician to the Archduke Stephen of Austria. This appointment secured time for zoological pursuits, the first outcome of which was a treatise on the *Development of the Diptera*. Impaired sight compelled abandonment of microscopical work for some years, and Weismann next turned to the study of the problem of variability of organisms, on which the doctrine of descent with modification is based. The results of this, drawn mainly from observations on caterpillars and other insects exhibiting metamorphosis, appeared in a series of papers issued between 1868 and 1876, of which an English translation by R. Meldola, with prefatory note by Darwin, was published in 1882 under the title of *Studies in the Theory of Descent*. But it is round the answer which Weismann, after many years of research, gave in his *Essays upon Heredity and Kindred Biological Problems* (Eng. trans. vol. i. 1889; 2d ed. 1891; vol. ii. 1892) to the question 'How is it that a single cell of the body can contain within itself all the hereditary tendencies of the whole organism?' that interest and controversy have gathered. In all theories of Heredity (q.v.) biologists have assumed that characters acquired by the individual are transmitted to offspring. This Weismann denies, and, while biologists have concerned themselves with speculation as to the mode by which such transmissions are effected, he challenges them to prove that they are effected at all. The *onus probandi* is thus thrown upon his opponents, whose assumptions must give way to experimental evidence, which alone can determine, and that only after protracted record of cases, whether individually-acquired characters are transmitted or not.

Death, he contends, is not a primary attribute of living matter; the Protozoa, or one-celled organisms, being immortal in so far that they do not die naturally. The Protozoon, a microscopic, jelly-like, apparently—not really—structureless mass, with no seeming unlikeness of parts, multiplies by division. Each half becomes a complete individual, and grows in like manner as the whole to which it belonged, till it also divides, and so on with the multiplication of Protozoa *ad infinitum*. It cannot be said of either half that one is parent and the other offspring, for both are of the same age, and only, in a limited sense, as the subdivisions into separate individuals are repeated, can we speak of succession of generations. In these processes there is nothing analogous to death. 'There are,' Weismann says, 'no grounds for the assumption that the two halves of an amœba are differently constituted internally, so that, after a time, one of them will die while the other continues to live. Observations show that when division is almost complete the protoplasm of both parts begins to circulate, and for some time passes backwards and forwards between the two halves. A complete mingling of the whole substance of the animal, and a resulting identity in the constitution of each half, is thus brought about before the final separation' (*Essays*, p. 26, 1st ed.). Consequently, there is unlimited persistence of the individual; potential, although not absolute, immortality so long as life lasts on the earth.

While the one-celled organisms are thus immortal, only the reproductive cells of the Metazoa, or many-celled, are immortal. How has this come about? Weismann accounts for it by the failure of certain Protozoa to divide equally, whereby unlikeness of parts and differences of position of parts resulted. 'The first multicellular organisms were probably clusters of similar cells, but these units soon lost the original homogeneity. As the result of mere relative position there arose division of labour, some of the cells were especially fitted to provide for the nutrition of the colony, while others undertook the work of reproduction' (*Ib.* p. 27). Clearly, those on the outside, being exposed to the direct and constant action of their surroundings, would be the media of nutrition, and the builders-up of the cell-commonwealth. So the result of this cell-clustering would be that the cells fell into two classes, body cells and germ-cells. While the body cells were solely concerned with the nutrition of the organism, losing in this specialisation of function the power of reproduction, that power became concentrated in the germ-cells, or, speaking more precisely, in the germ-plasm, which is located in the nucleus of the germ-cell. It is these germ-cells which are the immortal part of the Metazoa. 'It is necessary to distinguish between the mortal and immortal part of the individual—the body (*soma*) in its narrow sense—and the germ-cells. Death affects only the former; the germ-cells are potentially immortal, in so far as they are able, under favourable circumstances, to develop into a new individual' (*Ib.* p. 122). With increasing subdivision of function there has been increasing modification of the organism, but the twofold classification of the somatic or body cells and the germ-cells has remained. The death of the body cells is involved in the ultimate failure to repair waste, because a worn-out tissue cannot for ever renew itself, and because cell-division has its limits. In brief, death is the penalty paid for complexity of structure. As it is impossible for the germ-cell to be, as it were, an extract of the whole body, and for all the cells of the body to despatch particles to the germ-cells whence these derive their power of heredity (the fundamental idea of Darwin's theory of Pangenesis), the germ-cells, so far as their essential and characteristic substance is concerned, are not derived from the body of the individual, but directly from the parent germ-cell. Heredity, Weismann contends, is secured by the transference from one generation to another of a substance with a definite chemical and molecular constitution—in other words, by the 'continuity of the germ-plasm.' This germ-plasm (which, Weismann's critics argue, runs perilously near a metaphysical concept) is assumed to possess a highly complex but extremely stable structure, so stable 'that it absorbs nourishment and grows enormously without the least

change in its complex molecular structure' (*Ib.* p. 271). Of this germ-plasm it is further assumed that a small portion contained in the parent egg-cell is not used up in the construction of the body of the offspring, but is reserved unchanged for the formation of the germ-cells of the following generations. 'One might represent the germ-plasm by the metaphor of a long creeping root-stock from which plants arise at intervals, these latter representing the individuals of successive generations' (*Ib.* p. 266). 'These individuals are nothing more than the transient offshoots of a germ-plasm which has an unbroken continuity from age to age. . . . Thousands upon thousands of generations which have arisen in the course of ages were its products, but it lives on in the youngest generation with the power of giving origin to coming millions.' (Sir W. Osler, *Science and Immortality*, p. 60.)

Only variations of the germ-plasm itself are inherited, and it is upon these variations that natural selection operates. Variations are due not to the influence of external condition nor to use or disuse of organs, but to sexual conjugation. This process combines two groups of hereditary tendencies derived from the mingled germ-plasms of the male and female parents, resulting in those individual differences which form the material from which new species are produced by the action of natural selection. Those differences multiply in geometrical ratio, so that 'in the tenth generation a single germ contains 1024 different germ-plasms with their inherent hereditary tendencies, and, as continued sexual reproduction can never lead to the reappearance of exactly the same combinations, new ones must always arise' (*Essays*, p. 276).

So the sum of the matter is that natural selection is the dominant factor, that use and disuse of parts and the action of the environment count for nothing, or, at the most, for but a little. Here and there Weismann makes concessions as to the modifying influences of body cells on the germ-cells (*Ib.* p. 170), and as to the ultimate origin of hereditary individual differences in the direct action of surroundings (*Ib.* p. 279), which are a partial surrender of his main contention as to the isolation of the germ-plasm. The vulgar notions concerning the transmission of mutilations and developments of non-vital parts are altogether without evidence, as are the beliefs in coincidence between maternal shocks and impressions and 'birth-marks,' and other malformations in the offspring. Weismann's opponents contend that it is not easy to reconcile the theory of an insulated 'germ-plasm' with the ceaseless manufacture, secretion, and expulsion of germ-cells, the materials of which are derived from the materials nourishing the entire organism. The evidence thus far tends to negative the theory that changes in habits and surroundings are factors in organic evolution. And in the resistance of the germ-plasms to those factors lies the security against degeneracy and decay. Hence the wide-reaching sociological significance of the doctrine of Heredity—which may be regarded as the physical correlate of Determinism—gives an importance to the labours of Weismann that cannot be overrated, and makes urgent the record of extended observations in Eugenics (q.v.) on the lines already laid down by Galton.

For bibliography of subject, see list of books at end of article HEREDITY, also the articles DARWINIAN THEORY, VARIATION, and cognate articles in this work; Weismann's *Essays* (1892) and *The Germ Plasm* (1893); G. J. Romanes, *An Examination of Weismannism* (1893); Herbert Spencer's *Rejoinder to Professor Weismann* (1894); Weismann's *Evolution Theory* (trans. 1905); E. S. Goodrich, *Living Organisms* (1925).

Weiss, BERNHARD (1827–1914), a learned German theologian, was born at Königsberg, studied at Königsberg, Halle, and Berlin; became privat-dozent at Königsberg in 1852, and professor extraordinary in 1857; and was called to a chair at Kiel in 1863, to Berlin in 1877, where also in 1880 he became superior consistorial councillor and adviser to the government in spiritual concerns. Of his numerous works three stand among the first in importance of their time: *Lehrbuch der biblischen Theologie des neuen Testaments* (1868; 5th ed. 1888; Eng. trans. 2 vols. 1882–83), a book unequalled in grasp and insight; *Lehrbuch der Einleitung in das neue Testament* (1887; Eng. trans. 1887–88), the fullest and best orthodox book on the subject; and *Das Leben Jesu* (1882; Eng. trans. 3 vols. 1883–84).

Weissenburg. See WISSEMBOURG.

Weissenfels, a town of Prussian Saxony, 35 miles SW. of Leipzig, with an old castle, miscellaneous manufactures (see FURS) of machinery, ironware, &c. There are deposits of sandstone and lignite near by. Pop. (1925) 36,747.

Weitbrecht, GOTTLOB FRIEDRICH, theologian, was born at Culm, 4th June 1840, studied at Tübingen, and after travels in England and Scotland, and a considerable experience in teaching, settled in 1885 as pastor in Stuttgart. Of his numerous writings need only here be named *Das Leben Jesu* (3d ed. 1896); *Unser Glaube* (1888); *Die Sittlichkeit des Mannes Ehre* (1889).

Weizsäcker, KARL, an eminent German theologian, was born at Oehringen near Heilbronn, December 11, 1822, studied at Tübingen and Berlin, and became successively *privat-docent* in theology at Tübingen (1847), preacher (1848), court-chaplain in Stuttgart (1851), superior consistorial councillor (1859), and successor to Baur in the theological faculty at Tübingen (1861). He edited the *Jahrbücher für deutsche Theologie* from 1856 to 1878, and made his name widely known by the profound learning and unusual lucidity of his *Untersuchungen über die evangelische Geschichte* (1864) and *Das apostolische Zeitalter* (1886–89). Other writings are on the epistle of Barnabas (1863), on the Tübingen theological faculty (1877), and a new translation of the New Testament (1875). He died 13th August 1899.—His brother, JULIUS WEIZSÄCKER, historian, was born at Oehringen, 13th February 1828, studied theology at Tübingen, but early gave himself to historical studies at Berlin and Paris, habilitated as *privat-docent* in history at Tübingen, and filled chairs successively at Erlangen (1864), Tübingen (1867), Strasburg (1872), Göttingen (1876), and Berlin (1881). He died at Kissingen, 3d September 1889. Already he had written on the origin of the Pseudo-Isidorian decretals, when in 1860 he was called to Munich to undertake under Sybel's direction the editing of the *Deutsche Reichstagsakten*, which the then sitting Historical Commission had determined to publish. Of this vast work he lived to edit six volumes (1867–87; i.–iii., those under King Wenzel; iv.-vi., those under King Ruprecht, 1376–1410).

Welbeck Abbey, the seat of the Duke of Portland, in Nottinghamshire, 3 miles S. of Worksop. Occupying the site of an old Premonstratensian abbey, it came from 'Bess of Hardwick' to her son Sir Charles Cavendish, the father of the first Duke of Newcastle, whose far-away heiress married in 1734 the second Duke of Portland. It stands in a park 10 miles in circumference, and is a stately Palladian edifice of mainly the 17th and 18th centuries, but was greatly enlarged about 1864 by the fifth duke, to whom it owes its semi-underground picture-gallery, ball-room, and riding-school, the last 385 feet long, 104 feet wide, and 51 feet high.

Welcker, Friedrich Gottlieb, a great German scholar, was born 4th November 1784 at Grünberg, in Hesse-Darmstadt, studied at Giessen, spent the years 1806–7 in Rome, filled a chair at Giessen, fought against the French as a volunteer in 1814, spent the following winter in Copenhagen writing the life and editing the remains of Zoega, was next called to a chair at Göttingen, and finally (1819) in the newly-erected Prussian university of Bonn, where he laboured till his death, 17th December 1868. His chief works are *Die aeschyleische Trilogie* (1824–26); *Die griech. Tragödien mit Rücksicht auf den epischen Cyklus* (3 vols. 1839–41); *Der epische Cyklus oder die homerischen Dichter* (2 vols. 1835–49); *Griech. Götterlehre* (3 vols. 1857–63). His *Kleine Schriften* (5 vols. 1844–67) contain his contributions to the *Archäol. Zeitung*, *Rhein. Museum*, &c. See the Life by Kekulé (1880).—His brother, Karl Theodor Welcker (1790–1869), was an eminent publicist and Liberal politician, filled chairs at Kiel, Heidelberg, Bonn, Freiburg, and edited with Rotteck the *Staatslexikon* (12 vols. 1834–44).

Weld, or Woold, also called Dyer's Rocket, Dyer's Weed, and Yellow Weed (*Reseda Luteola*), is a plant of the same genus with Mignonette (q.v.), a native of waste places in England, very common in Germany and in many parts of Europe. It has an upright stem two to three feet high; lanceolate, undivided leaves; and long racemes of small yellow flowers, with four-partite calyx and prominent stamens. It was formerly much used for dyeing, but has been largely superseded by other dyes (see Dyeing). The best is grown in France, England, and Holland. Good weld must have flowers of a beautiful yellow or greenish colour, and should abound in leaves; that which is small, thin-stemmed, and yellow is better than that which is large, thick-stemmed, and green.

Dyer's Rocket (*Reseda Luteola*).

Welding. When iron or steel is raised to a white heat it passes into a pasty condition, and in this state two pieces can be *welded*—i.e. firmly united together by pressure or hammering. The welding of two lengths of bar or plate iron can be effected more easily than can a piece of iron to a piece of steel. The tensile strength of a blacksmith's welded joint does not often exceed three-fourths of that of a solid piece of iron of the same section and kind. Chain-link welds are, however, an exception to this, some of them being nearly as strong as the solid metal. Some metals pass too rapidly from the solid to the liquid state to admit of being welded. Horn and especially tortoise-shell among animal substances can be welded when they are softened by heat.

Welding by means of the oxy-acetylene blowpipe is very considerably used in the manufacture of ferrous and non-ferrous articles of sheet and other metal. The parts adjacent having been bevelled off with a clean surface to form a V groove of 45° to 60°, the edges are heated by a blowpipe flame, while metal is melted from the end of a 'welding rod' of suitable composition to fill the groove as the operator works from one end of the joint to the other. The size of the blowpipe and of the welding rod must be suitable to the thickness of the metal under treatment, while special fluxes are used to form protective slags over the molten metal to prevent oxidation. 'Coated' rods have the appropriate flux already upon them.

The electric arc is used for ferrous metals in a somewhat similar way to produce the necessary welding heat. Here the welding rod may act as one electrode, and, being held in an insulating handle, is used to direct the arc along the seam at the same time it supplies the necessary metal for the operation. It is sometimes coated with a suitable flux which up to the instant of melting assists in localising the arc, and afterwards prevents the oxidation of the molten metal. Carbon electrodes are also used.

The voltage required to strike the arc is about 90 volts, which falls considerably when once the arc is established and work is proceeding. If too high voltage is used it increases the tendency of the arc to stray.

In the *Times Trade Supplement* of November 1922 mention is made of a gas-holder at Melbourne weighing 600 tons rebuilt by the 'Quasi-arc' method of electric welding which involved the use of over 40 miles of fillet-welding.

Welf. See Guelphs and Ghibellines.

Welhaven, Johann (1807–73), lyric poet. See Norway (*Literature*).

Well. See Artesian Wells, Divining-rod, Pumps, Spring, Water, Wells.

Welland Canal connects Lakes Ontario and Erie, overcoming the Falls of Niagara (see Canals). Altogether four canals have been constructed, the first in 1829. The third, from Port Dalhousie to Port Colmore, was finished in 1887, and is 26¾ miles long; while the fourth was begun in 1913 (Port Weller to Port Colborne), with length of 25 miles, and 7 locks to accommodate vessels 800 feet in length and 30 feet in depth.

Welle, a great river of Equatorial Africa, rising in the Monbuttu country and keeping a mainly westward course to 19° W., where it turns southwestwards, and as Mobangi or U-banghi enters the Congo. Schweinfurth, its discoverer, thought the Welle or Maku joined the Shari, and so fell into Lake Tsad; Stanley held it to be a tributary of the Congo through the Aruwimi; Grenfell proved its connection with the Congo. See Boyd Alexander, *From Niger to Nile* (1907).

Wellesley, Province. See Penang.

Wellesley, Richard Colley, Marquis, was born in Dublin, 20th June 1760. His father, the first Earl of Mornington (1735–81), was a man of great ability, chiefly known for his musical attainments. Richard was educated at Eton, then at Christ Church, Oxford, and distinguished himself by his mastery of the classics, and especially by the remarkable excellence of his Latin verse. On his father's death in 1781 he took his seat in the Irish House of Peers, and in 1784 he was returned to the parliament at Westminster as member for Beeralston in Devonshire, sitting later for Saltash and Windsor. He supported Pitt's policy and Wilberforce in his efforts to destroy the slave-trade, and as early as 1786 became one of the Lords of the Treasury, having had the good fortune also to gain the favour of George III. In 1793 he became a member of the English Privy-council and of the Board of Control, and in October 1797 he was selected by Pitt to be Governor-general of India, and raised to the English peerage as Baron Wellesley. At this time the power of England was by no means supreme in India, but at the close of Wellesley's administration in 1805 she had become predominant, the revenue of the

company raised from seven to fifteen millions, the foundations of British India securely laid. He cleared out the French from the Peninsula by ordering the Nizam to disband his French contingent of 14,000 men, and sent English soldiers to take their place, and in May 1799 crushed the dangerous power of Tippoo Saib when General Harris took Seringapatam by storm. This year he was made Marquis of Wellesley, and received the thanks of parliament, while later the Court of Proprietors voted him an annuity of £5000. In 1802, mortified by misunderstandings at home, he offered to resign, but was induced to remain because of the threatening clouds on the horizon. The great struggle with the Mahrattas soon broke out, but was closed by the energy of Wellesley and of his younger brother Arthur, afterwards Duke of Wellington. In 1805 Wellesley returned to England, where he never overcame the mortification of finding that he no longer stood first of men as he had done in India. He chafed much under the attacks on his administration which were made in parliament. In 1809 he went as ambassador to Madrid to urge a more vigorous support to his brother in the struggle within the Peninsula against the French, and on his return was made Foreign Minister and a Knight of the Garter. He became Lord-lieutenant of Ireland in 1821 and again in 1833. He died at Kingston House, Brompton, 26th September 1842, and by his own desire was buried in the chapel of Eton College.

See the *Memoirs and Correspondence*, edited by Robert R. Pearce (1846); the *Despatches, Minutes, and Correspondence*, edited by Montgomery Martin (1840); *The Wellesley Papers* (1914); the study by Col. Malleson (1889), and that by W. H. Hutton (1893).

Wellhausen, JULIUS (1844–1918), a learned Old Testament scholar, born at Hameln, studied at Göttingen under Ewald, became *privat-docent* there in 1870, and ordinary professor of Theology at Greifswald in 1872. He resigned in 1882 from conscientious reasons, first became professor extra-ordinary in Philology at Halle, and in 1885 professor of Oriental Languages at Marburg, and in 1892 at Göttingen. He made his name known by his able and uncompromising application of the views of Graf and Kuenen to the fundamental problems of Old Testament History.

His books include *Der Text der Bücher Samuelis* (1872), *Die Pharisäer und die Sadduzäer* (1874), *Geschichte Israels* (vol. i. 1878, rewritten as *Prolegomena zur Geschichte Israels*, 1883; Eng. trans. 1885), *Skizzen und Vorarbeiten* (5 parts, 1884–89), *Muhammed in Medina* (1882), *Die Komposition des Hexateuchs* (1889; new ed. 1899), *Israelitische und jüdische Geschichte* (1894), *Reste arabischen Heidentums* (1897), *Das arabische Reich und sein Sturz* (1902), *Einleitung in den drei ersten Evangelien* (1905), *Analyse der Offenbarung Johannis* (1907). Wellhausen also edited editions of Bleek's *Einleitung in das Alte Testament* (1878, 1886, 1893).

Wellingborough, a market-town of Northamptonshire, on a declivity near the confluence of the Ise with the Nen, 10½ miles ENE. of Northampton; is on the main line of the London Midland and Scottish Railway (Midland section); and is, in addition to being an enterprising industrial town, an active centre of agricultural interests. Almost destroyed by fire in 1738, it has a chalybeate spring (the 'Red Well'), said to have been resorted to by Charles I. and Henrietta Maria; a large and imposing parish church (restored 1861–74), mainly Decorated and Perpendicular in style; a corn exchange (1861); a grammar-school (1595), transferred to new buildings in 1880, now the Wellingborough School, and important industries of bootmaking, iron-smelting, manufacture of ready-made clothing, &c. Pop. 21,000.

Wellington, a market-town of Shropshire, 2 miles NE. of the conspicuous Wrekin (1320 feet) and 10 E. of Shrewsbury. It stood near the ancient Watling Street, hence its name 'Watling Town.' Situated in a populous mining and agricultural district, it has some manufactures of farm implements, &c., an Italian town-hall (1867), and a corn exchange (1868). Pop. 8000.

Wellington, a market-town of Somerset, 7 miles SW. of Taunton, near the Tone and the foot of the Black Downs (900 feet), which were crowned in 1817 by a Wellington obelisk. The 'Great Duke' for some unknown motive took his titles from this place; and its manor (held formerly by King Alfred, Asser, Aldhelm, the Protector Somerset, the Pophams, &c.) was purchased for him in 1813. The large Perpendicular church has a Jacobean monument to Chief-justice Popham; and T. S. Baynes was a native. Serges and other woollen goods are manufactured. Pop. 7000.

Wellington, the capital of New Zealand, on Port Nicholson, an inlet of Cook Strait, on the southern coast of the North Island, 180 miles by sea from New Plymouth, and 150 miles from Nelson. The town is built on hills, the ground rising steeply all round. It was the first settlement of the New Zealand Company, and was planted under the direction of Colonel Wakefield, with a band of pioneer colonists, in 1840. The harbour is a fine expanse of water, 6 miles long and 5 broad, and has an excellent wharf, affording accommodation to ships of any tonnage. After the removal of the seat of government hither in 1865 the town made rapid progress; its buildings include Government House, Houses of Legislature (burnt 1907, and rebuilt), government and other public buildings, art-gallery, museum, hospitals, banks, &c.; there are three good libraries, botanical, public, and zoological gardens; Victoria College (part of the University of New Zealand) is situated here. The streets are busy, but some of them are rather narrow. Wellington is the seat of an Anglican bishop and a Catholic archbishop, and possesses two cathedrals. It is an important railway and shipping centre, with a large trade. Amongst its works are tanneries, breweries, candle and soap works, boot-factories, meat-preserving, flour and saw mills, and ship-yards. The suburb of Newton or South Wellington is connected by tramway with the older town. Pop. (1888) 28,000; (1901) 43,638; (1921) 88,920, or with suburbs, 107,488.

Wellington, DUKE OF, the Hon. Arthur Wellesley (or Wesley), was third of the four sons who reached man's estate of Garret, first Earl of Mornington, of Dangan Castle, County Meath, and Anne Hill, daughter of Lord Dungannon. He was born on 29th April 1769, according to a committee of the House of Commons which had to decide, in April 1790, whether or not he was then of age, and therefore eligible to take his seat. But Lady Mornington always insisted that he was born on May-day 1769, and the duke himself kept that day as his birthday, though his baptismal certificate is dated April 30. The place of his birth, too, is somewhat doubtful, but it was probably Mornington House, 24 Upper Merrion Street, Dublin, and not Dangan Castle, as sometimes stated. It is remarkable that the same year produced his great antagonist Bonaparte, and that similar uncertainty exists as to the date of his birth, now allotted to August 15. His three brothers were all men of mark and eminent scholars, but he was for many years considered the dunce of the family, and was by no means a favourite with his mother.

He went first to school at Chelsea and then to Eton, distinguishing himself at neither as regards

learning, but gaining some renown at the latter by fighting 'Bobus' Smith, brother of the witty Canon Sydney Smith of St Paul's. From Eton he went to a French military school at Angers for about a year, was 'not very attentive to his studies,' and rather weak in health, but acquired a useful knowledge of the language.

On 7th March 1787 he received his first commission as ensign in the 73d Foot. His eldest brother Richard, Earl of Mornington since his father's death in 1781, watched over him and gave him the benefit of his great political and social influence, so that he soon became lieutenant in the 76th Foot, then in the 41st Foot, and then in the 12th Light Dragoons. From captain in the 58th Foot, he went in 1792 to the 18th Light Dragoons. Then, being promoted into the 33d Foot as major, he purchased the lieutenant-colonelcy of that regiment in September 1793, with money provided by his brother. In the meantime he had served as aide-de-camp to two viceroys of Ireland, Lords Westmoreland and Camden, and entered parliament as member for Trim. In 1796 he became engaged to the Hon. Catherine Pakenham, third daughter of Edward Michael, second Lord Longford; but they were not allowed to marry until 10th April 1806, when he returned from India a major-general and victor in several great battles. Up to 1793, when he assumed command of the 33d Regiment, he had been considered dull, idle, and perhaps frivolous, but he soon showed very different traits, and worked so earnestly and wisely that his regiment was in a few months officially declared to be the best drilled and most efficient in the Irish command. In 1794 a force under Lord Moira was despatched to succour the Duke of York, who, beaten at Oudenarde, was retiring on Antwerp. Here the 33d joined the army, and its commander, who had resigned his seat in parliament in order to lead it, commenced his war service by taking part in a retreat, for the French had cut the allies in two, the Austrians retiring by Maestricht, the British towards Holland. The first engagement in which Arthur Wesley, as he then signed himself, took part was during the retreat of General Abercrombie's brigade from Boxtel, which place they had tried to retake, but without success. The 33d were in support, and by their steady fire, added to the skilful way in which they were handled, were able to beat off the enemy at a very critical moment. Wesley's coolness and promptitude on this occasion were noticed by his superiors, and he was selected to command the rear-guard, and faithfully fulfilled this arduous task. The retreat was made in winter weather of unusual severity, and great privations were endured. The superior officers, too, of this unfortunate expedition were criminally careless and indolent, so that the final escape of the army to its ships in the spring seemed to Wesley almost miraculous. So great was his disgust at the way this affair had been mismanaged that, on reaching his home at Trim, he applied for civil employment, indicating the Revenue or Treasury Board as his preference. But his request was not complied with, and soon after he was ordered with his regiment to the West Indies. They embarked, but after striving in vain for six weeks to get out of the Channel, returned to Spithead. He then led the 33d to Poole, and there became so seriously ill that he could not embark when, in January 1796, the regiment started for the East Indies. However, by taking passage on board a swift man-of-war, he overtook it at the Cape, and landed with it at Calcutta in February 1797. Within two months he was nominated to command an expedition against Manila; but the troops were recalled when they had but reached Penang. He occupied himself in compiling regimental orders for troops on board ship, and wrote papers on Pulo-Penang and on Bengal, which showed great talent as a financier. He also wrote on the necessity of expelling the French from Mauritius, and on many other subjects connected with the government of India. At the same time he energetically protected the interests of his men whenever threatened.

In the winter of 1797 he visited Lord Hobart at Madras, and his military memoranda of that date show how customary it was with him to study the topography of any country he might be in, a habit which led him, three years beforehand, to select the field of Waterloo as the spot on which a battle for the defence of Brussels against an invasion from the south ought to be fought.

On 17th May 1798 his brother, Lord Mornington, landed at Calcutta as governor-general. A letter written on this occasion was the first signed 'Arthur Wellesley,' a spelling which, following the usage of his family, he henceforward adopted. Lord Mornington found the British settlements, then a mere fringe on the edges of India, in considerable danger. Bonaparte was in Egypt, threatening to attack India, and Tippoo, sultan of Mysore, was coquetting with the governor of Mauritius, by whose aid he hoped to drive the British out of the country. After some months of vexatious delay, utilised, however, in preparations and much diplomatic fencing, an expedition against Tippoo was set on foot. Wellesley and the 33d were despatched from Calcutta to Madras. The transport ran on the Ságar reef in the Hooghly, but soon got off undamaged. It took six weeks to perform the voyage, and all on board suffered from dysentery, fifteen men dying owing to the bad water. On 29th January 1799 General Harris took command, and General Stuart, with 6000 men, prepared to co-operate with him from Bombay in an attack upon Seringapatam, but was himself assailed without success, on 6th March, by Tippoo. Three weeks later General Harris' army, after capturing many fortified posts, met the sultan near Malvalli, on the right bank of the Maddoor. Wellesley, in command of the left brigade, moved in echelon, the 33d leading, against Tippoo's right, and his vigorous onset, combined with the charge of General Floyd's cavalry brigade, routed the enemy in less than two hours. His loss was but a few score in killed and wounded, the enemy's nearly 2000. General Harris then outmanœuvred Tippoo and invested him in Seringapatam. A night attack in two columns, on 5th April, against the outposts was only partially successful. The column led by Wellesley failed to find the post and got into confusion. Next day, however, the same troops carried the post with ease and little loss. Wellesley, who had been slightly wounded in the knee, was much mortified at his first failure. At the final assault, when Tippoo was slain, he led the reserve column, and took command of the place after its capture. By vigour and justice he put a stop to the great disorder which ensued, and restored confidence amongst the people. During three months as governor of Seringapatam he found himself engaged in numberless ways, as soldier, engineer, statesman, traffic-manager, and even sanitary authority. He had to bury Tippoo with due pomp, see to the removal and pensioning of his sons and wives, restore the old Hindu dynasty, and control the distribution of over a million sterling of prize money. In administering the affairs of the place he showed great capacity, and his opinion was sought in settling the future of the conquered province.

On 24th August 1799 he was appointed to command the troops in Mysore in General Harris' place, and engaged in the onerous work of establishing tranquillity there. The principal cause of trouble

was a Mahratta freebooter, Dhundia Wágh, who had collected some 5000 men and six guns, and executed numerous successful raids. After hunting him from 15th June to 10th September, Wellesley, at the head of four regiments of cavalry, and without waiting for his infantry, dashed upon him, killed him, and dispersed his following. In the camp his little son was found, of whom Wellesley took charge and was mindful in after years. When he quitted India he left some hundreds of pounds to be expended upon the boy, who died in 1822 of cholera. Prevented by illness from joining Baird's expedition from Kosseir to the Nile, Wellesley remained two years longer in Mysore, and on 29th April 1802 was promoted major-general.

The treaty of Bassein (December 31, 1802), which made an ally of the Peshwá, consolidated British power in India, but soon necessitated military operations against the rival Mahratta chiefs, Sindhia and Holkar, by whom he had been deposed. At the request of Lord Clive, General Wellesley was given the command of a mixed force some 10,000 strong, with which he covered 600 miles in forty-two days, and entered Poona, the Mahratta capital, on 20th April 1803. In the last march he rode with the cavalry alone 60 miles in thirty-two hours, and by his sudden appearance saved the city from being burned by Holkar's lieutenant Amrut Rao. Behind him he left posts, and arranged for the construction of basket-boats, so as to be able to continue his operations during the rainy season. For some time he occupied an isolated and dangerous position, threatened by the disaffected chiefs from the north and separated from a second division coming from the west under Colonel Stevenson. At length having received full political powers, he called upon Sindhia to withdraw north of the Nerbudda, and on his failing to do so declared war against him on 6th August 1803. General Wellesley moved at once, captured Ahmadnagar on the 11th, crossed the Godavari on the 21st, and on the 23d found himself confronted by the combined forces of Sindhia and the rajah of Berar at Assaye. Their numbers have been estimated at from 40,000 to 50,000, with a hundred guns. Judging that bold action was the safest, though the enemy's position was strong, he attacked at once, and after a much more serious battle than any which had hitherto been fought in India gained a complete victory, capturing all the Mahratta guns. His loss was 2500 out of a force little exceeding 7000 men. Stevenson's division having effected a junction with him pursued the enemy, and Wellesley finished the campaign by the victory of Argaum and the storming of Gáwilghar in December. The treaties with Sindhia and the raja of Berar were signed by him, and the Mahratta power was completely broken.

His despatches concerning these matters and Indian policy generally show him to have been one of the ablest of administrators. Now Sir Arthur Wellesley, K.B., he returned home early in 1805, and accompanied the abortive expedition to Hanover. The following year he entered parliament again as member for Rye, and in 1807 was appointed Irish Secretary, but after a few months was sent to Copenhagen, where he commanded the troops which drove the Danes out of Sjaeland. He then returned to the Irish Office, but in July embarked with some 10,000 men for the relief of Portugal. His army landed at Mondego Bay in August 1808, and on the 17th he defeated the French under Junot at Rolica. On the 21st he inflicted a second defeat upon them at Vimeiro, but was superseded during the battle by Sir Harry Burrard. He, contrary to Wellesley's advice, concluded the convention of Cintra, which ensured the evacuation of Portugal indeed, but saved the French from capitulation—the inevitable result if his plans had been adhered to.

Recalled to England to give evidence before the court of inquiry into the circumstances connected with the convention, by which he was fully exonerated, he took up his Irish duties again during the winter of 1808–9, while Sir John Moore's campaign was going on. But after its failure he was given the chief command in the Peninsula, and landed at Lisbon on 22d April 1809. Then began that marvellous display of generalship, foresight, and tenacity of purpose which, ending in the expulsion of the French from Spain and the capture of Toulouse on 12th April 1814, is known by the name of the Peninsular War (q.v.). The honours conferred upon him were numerous. He became Lieutenant-general on 26th April 1808; Baron Douro of Wellesley, county Somerset, and Viscount Wellington of Talavera and Wellington in the same county on 4th September 1809; Earl of Wellington on 28th February 1812, and Marquis on 3d October; Field-marshal on 3d July 1813; Marquis Douro and Duke of Wellington on 11th May 1814, and Knight of the Garter. He was also made Duke of Ciudad Rodrigo, Magnate of Portugal, and Grandee of the first class in Spain; Duke of Vittoria, Marquis of Torres Vedras, and Count of Vimeiro in Portugal; and received all the most distinguished foreign orders, including the Golden Fleece. It is remarkable that he took the place amongst the knights of the Bath rendered vacant by the death of Lord Nelson. The duke reached Paris early in May, and after a short visit to Madrid, where he gave good but unheeded advice to King Ferdinand VII., returned to England after an unbroken period of five years' active service.

He was heartily welcomed home. From Westminster Bridge, on 23d June 1814, the crowd dragged his carriage to the duchess's house in Hamilton Place. On the 24th he joined the Regent and his royal guests at Portsmouth, and then took his seat in the House of Peers. A committee of fifteen from the House of Commons presented the thanks and congratulations of that assembly, and on 1st July from a place inside the bar he thanked them for the grant of £400,000 voted on 12th May. A week later he carried the sword of state at the solemn thanksgiving service in St Paul's, and was entertained soon after by the city at the Guildhall.

Very soon afterwards he was sent as ambassador to Paris, where he was naturally ill received. Realising this, Lord Liverpool offered him the American command, but he declined to quit Europe, and remained at his post until the early part of 1815, when he took Lord Castlereagh's place at the Vienna congress. On 7th March of that year he heard by courier from Florence that Napoleon had quitted Elba. The allies at once directed their forces against France. Wellington took command of the army in the Netherlands, arriving in Brussels on 4th April. It was a hard task to form this army, but by the end of May he had under him 150,000 men—British, Hanoverians, Brunswickers, Nassauers, and Dutch-Belgians. The last were favourably inclined towards the French, and only about one-third of the whole was available for field-service. Blücher with 116,000 Prussians was, however, ready to act and in communication with him. Failing to induce the allies to negotiate, Napoleon quitted Paris on 12th June and threw himself upon Blücher and Wellington. On the 16th he defeated the former at Ligny, whilst Ney pressed hard upon the latter at Quatre Bras. But designing to fight in conjunction on the chosen position of Mont St Jean, the allies retired so as to effect this object, with the result that the French army was totally routed on the 18th June in the famous battle of Waterloo (q.v.). Paris capitulated on 3d July, and Napoleon

surrendered to the captain of H.M.S. *Bellerophon* at Rochefort.

Wellington was created Prince of Waterloo in the Netherlands, the estate of Strathfieldsaye, in Hampshire, purchased from Lord Rivers for £263,000, was presented to him by the nation, and his career of active service ended. Except Frederick the Great and Bonaparte in Italy, no general of modern times had done so much with such scanty and uncertain resources. But owing to the fact that the emperors of Austria and Russia were still at Nancy, Wellington in Paris held a most important position. In order to meet the hostility of the latter sovereign to Louis XVIII. by conciliating the French troops and populace, he found it expedient to appoint the powerful but infamous Fouché minister to the king, and in the subsequent treaty withstood the demand of Prussia for the cession of Alsace and Lorraine. He had already saved the Bridge of Jena from the destruction with which it was threatened by Prussian patriotism. Appointed commander-in-chief of the joint army of occupation, he exercised a very salutary influence in the royal counsels, besides reconstructing the military frontier of the Netherlands, and performing the other duties of the post. He had many enemies in Paris. An attempt to set fire to his house on the night of the 25th June 1816 nearly succeeded, but fortunately he was giving a ball, and his servants at once detected the smell of fire before it reached the barrels of oil and bottles of gunpowder which had been maliciously placed in the cellar. On the night of the 11th February 1818 a jolt of his carriage saved him from the bullet of the assassin Cantillon, which passed through both windows. In this year when the French had, by the help of Messrs Baring, paid all the indemnities, the congress of Aix-la-Chapelle, acting on his advice, terminated the occupation originally fixed for five years.

Returning to England he joined Lord Liverpool's cabinet as Master-general of the Ordnance. In 1826 he was made Constable of the Tower, and the following year Commander-in-chief. He represented Great Britain at the congress of Verona on the death of Lord Castlereagh, and was able to prevent any joint interference with the affairs of Spain. As a member of Lord Liverpool's administration, he agreed to the St Petersburg protocol of 4th April 1827, designed to urge upon Turkey the Greek claim to autonomy, but without threats of intervention. On Canning's becoming prime-minister and going beyond this he withdrew from the cabinet, resigning the offices of Master-general of Ordnance and Commander-in-chief. Canning then concluded the treaty of London on 27th July, binding France, England, and Russia to enforce the protocol. This, as Wellington had foreseen, brought about the battle of Navarino.

On the death of Canning in August 1827, and the fall of Lord Goderich's cabinet in January following, the duke became prime-minister—only, however, at the king's earnest desire. He disappointed the Tories by advising the Lords not to oppose the Test and Corporation Acts which had been passed in the Lower House, and by a quarrel with Huskisson lost his support and that of all the Liberal members of his cabinet. Becoming, with Peel, convinced that Catholic emancipation was necessary, he brought in a bill to grant it in 1829. As he had always hitherto opposed such a measure, he incurred thereby much odium; and the Earl of Winchilsea published a letter accusing him of a design to introduce Popery. The duke thereupon called him out, and a duel with pistols was fought in Battersea Fields—his first and only duel. The duke intentionally fired wide and the earl fired into the air, so that no harm ensued, and the calumnies ceased (see Vol. IV. p. 105). Desiring to work for the good of the country alone, and not as a party man, he could not work harmoniously with his colleagues. By withdrawing, after Navarino, from intervention in the East, he lost the power of moderating Russian influence there. In Portugal he was favourable to Dom Miguel and the absolutists, and generally showed little sympathy with national causes. Failing to recognise the earnestness of the demand for parliamentary reform in 1830, he declared against it, and thus brought about the fall of his government, becoming so unpopular that he was hooted by the mob on the anniversary of Waterloo, and the windows of Apsley House broken, so that he had them protected with iron shutters. On the occasion of a visit he paid to Lincoln's Inn the mob were so threatening that he had to be escorted home by the lawyers.

Again called upon by King William IV. in 1834 to form a cabinet, he recommended Peel as prime-minister, reserving for himself the post of Foreign Secretary. Sir Robert was in Italy, but the duke was sworn in as First Lord and Secretary of State for the Home Department, so as to enable him to act in all the other offices until Peel's return in three weeks' time. This brief dictatorship greatly raised his reputation as a statesman. In January 1834, too, he had been chosen Chancellor of the university of Oxford. Sir Robert Peel resigned in April 1835, but returned to power in 1841. Wellington joined his cabinet, but with no office except that of Commander-in-chief, and supported his Corn-law legislation. On his defeat in 1846 the duke retired from public life. He had been made Lord High Constable of England and again Master-general of Ordnance in 1838, and in 1842 Commander-in-chief by patent for life. In 1848 he organised the military in London against the Chartists in such a way that, without showing a soldier or a gun, the city was fully protected.

As age crept over him he became irritable about trifles and rather deaf, but retained his patience in grave matters and his keen eyesight. His last important service was a letter upon the defenceless state of the south coast, addressed to Sir John Burgoyne, which had great results. At the opening of the Exhibition of 1851 he walked in the procession, but on 14th September the following year faded peacefully away in his arm-chair at Walmer. After lying in state at Chelsea Hospital, he was buried with great pomp in St Paul's. All European nations, except Austria, were represented at the funeral, and it was felt by all that a great captain and a supremely dutiful, honest man had passed away. The monument to his memory, by Alfred Stevens (q.v.), is an imposing tribute to his worth. Before age had bowed his figure, his height was 5 feet 9 inches, his build slight, but with square shoulders and a good chest. His eyes were violet-gray, clear and penetrating; his nose, Roman; hair, brown; and his whole countenance, which has been compared to Cæsar's, expressive of great power and resolution. Though accused of want of feeling, there are many instances of the 'Iron Duke' being much affected by the loss of friends, and his charity, though unostentatious, was profuse. Gleig asserts that he gave away £4000 in one year. He was a man of the strictest integrity and devotion to duty. In everything he looked upon himself as the servant of the sovereign, and never allowed personal considerations to sway his opinions or actions.

His duchess had died on 25th April 1831, leaving three sons and three daughters. His eldest son, Arthur Richard, second Duke of Wellington, K.G., &c., born 3d February 1807, died without issue 13th August 1884, and was succeeded by his nephew Henry (1846–1900), second son of Major-general

Lord Charles Wellesley, whose third son became fourth duke.

See Lives by Wright (1841), Gleig, General Brialmont, Yonge, G. L. Browne, Hooper, Earl Roberts (1895), Sir H. Maxwell (1899), Fitchett (1911), and Fortescue (1925); his despatches edited by Gurwood (1834 *et seq.*), and others edited by his son, who also published his speeches and some of his letters; other letters published 1890, 1903, 1927. For his natural gaiety, social charm, and personal magnetism, see *The Diary of Frances Lady Shelley* (ed. Edgcumbe, 1912) and the Memoirs of Greville and other contemporaries. See also NAPOLEON, PENINSULAR WAR, WATERLOO, &c., and the books there cited.

Wellington College, in Berkshire, 4 miles SSE. of Wokingham, a public school founded in 1853, in memory of the Duke of Wellington, from funds raised by public subscription. The foundation-stone was laid by Queen Victoria in 1856, and it was opened by her in 1859. It has ninety scholarships for the sons of deceased army officers, seven open and twelve other scholarships, and some 500 boys.

Wellingtonia. See SEQUOIA.

Wells, streams, and lakes among primitive peoples are usually regarded as infested by local nature-spirits, kind or cruel, to which offerings may be made. The savage invests everything with personality and life, and what is poetry to us is philosophy to him. The Ganges is still a sacred stream even to the civilised Hindu, and we need not be surprised to find the Xanthos or Scamander among the Homeric Greeks provided with its priest and appeased with sacrifices. Melusine (q.v.); the water-kelpie, for which it came out before the Crofters Commission in 1888 that a loch in the Gairloch district had been trawled and quicklimed in vain not twenty-five years before; and the sea-serpent seen every now and then on our shores show the malignant side of this nature-superstition, just as its more beneficent aspects are seen in our healing-wells and wishing-wells, in the 'well-wakes' that lingered in corners of Shropshire into the 19th century, and the floral-offerings—'well-dressings' of Derbyshire (notably at Tissington), Staffordshire, Westmorland, and north Lancashire, to which Milton alludes in *Comus*. Christianity only substituted a saint's name for the indigenous nature-deity, and water-worship held its place—in Brittany, in Ireland, in St Chad's baptismal well at Lichfield, St Milburga's at Much Wenlock, and hundreds of other places. The worship of fountains is condemned in the canons of St Anselm (1102), but continued for centuries afterwards. In St Bede's well, near Jarrow, weakly children are dipped and crooked pins offered; at St Helen's well in Yorkshire pieces of cloth are offered; Fergan well in Banffshire was good for skin diseases and running sores; St Dwynwen's well in Anglesea was good against love-sickness, St Cynhafal's in Denbighshire against warts; at Sefton in Lancashire there is a well into which maidens throw pins in order to divine the date of marriage and test the fidelity of their lovers. Ailing children were carried to St Anthony's well at Maybole on the first Sunday of May; the well at Trinity Gask in Perthshire was sought on the first Sunday of June. The well of St Keyne in Cornwall (see Southey's ballad) had properties of special interest to husbands and wives. The most famous of all in England is that at Holywell which sprang up of itself at the place within St Beuno's Church to which rolled the head of St Winifred when struck off by Caradog ab Alan. In 1876 the well was leased to the corporation of Holywell by the Duke of Westminster for a thousand years at a sovereign a year. There is but one story against its virtue told by Lilly of Sir George Peckham, who died in 1635, 'having continued so long mumbling his pater nosters and "Sancta Winifreda, ora pro me," that the cold struck into his body, and after his coming forth of that well he never spoke more.' At St Tecla's well in Denbighshire a man could transfer his epilepsy to a cock after bathing in the well. Richard Baxter when a schoolboy heard a well at Oundle in Northamptonshire emit a noise like a drum about the time the Scots came into England, and was told the same well drummed again when Charles II. died. St Elian's in Denbighshire is the chief of the 'cursing-wells' of Wales, and it is possible to make an enemy pine by casting into it a pin and a pebble inscribed with his name.

See Hardy, *Holy Wells in Ireland* (1840); Hope, *Lore of Holy Wells in England* (1893); Rhys, *Sacred Wells in Wales* (1893); Mackinlay, *Folklore of Scottish Lochs and Springs* (1893); Weinhold, *Verehrung der Quellen in Deutschland* (1898); J. R. Smith, *Springs and Wells in Greek and Roman Literature* (1922).

Wells, a city of Somerset, pleasantly situated at the foot of the Mendip Hills, 20 miles SW. of Bath and 20 S. of Bristol. Here, near St Andrew's Well, from which and other springs the place took its name, King Ina in 704 established a house of secular canons; but the see was first founded in 909 by Edward the Elder, and the city has grown up round the cathedral. The see was translated (temporarily) to Bath during the first half of the 12th century, and still is styled Bath and Wells, though Bath's connection has been purely titular since the Reformation. Among its bishops have been Jocelyn (1206–42), the 'second founder' of the cathedral, Fox, Wolsey, Barlow, Laud, and Ken. The cathedral, though one of the smallest yet perhaps the most beautiful of English cathedrals, is mainly Early English in style, and is 383 feet long, by 123 across the transept, while the height of the central tower is 165 feet, of the two western towers 125. It was begun about 1186 and was consecrated in 1239. Its principal glory is the west front, erected by Bishop Jocelyn, with its matchless sculptures (over 300 figures in all, of which 152 are life-size or colossal); but other features are the carving of the north porch, the inverted tower arches, the capitals in the nave and transepts, the east Jesse window with its splendid old glass, the exquisite lady chapel (early 14th century) with beautiful stained glass; and the octagonal chapter-house with its windows and central column in the perfect Decorated style of 1300. Other buildings, all of extreme interest, are the moated episcopal palace, with an undercrypt of about 1220; the deanery, rebuilt by Dean Gunthorpe in the reign of Edward IV.; the archdeaconry, now remodelled as a theological college; the vicars' close; and St Cuthbert's Church, with a noble west tower. Chartered by King John in 1202, Wells lost one of its members in 1867, and the second in 1868. Pop. (1921) 4372. See the work on the cathedral by Dearmer (1915).

Wells, CHARLES JEREMIAH, a poet long strangely neglected, was born in London in 1800. He was a school companion of R. H. Horne and Keats's brother at Edmonton, and at the age of fifteen sent Keats a present of flowers, which the poet acknowledged in the sonnet beginning 'As late I rambled in the happy fields.' A few years afterwards he quarrelled with Keats, and his *Stories after Nature*, fantastic and sometimes graceful tales in poetic prose, showing strangely the influence of Leigh Hunt, were written, it is said, to show Keats that he 'could do something.' The book, which was published in 1822, fell still-born, and was followed in 1842 by the remarkable biblical drama, *Joseph and his Brethren*, which, though praised by R. H. Horne in *The New Spirit of the Age* in 1844,

remained all but unknown until attention was directed to its beauties by Rossetti in Gilchrist's Life of Blake (1863). Soon after, Swinburne in the *Fortnightly* (1875) hailed its author as 'a poet meant to take his place amongst the highest'; once only hitherto had such a character as Phraxanor been given with supreme success—in Shakespeare's Cleopatra. Wells, who had abandoned professional work for a country life in Wales and Hertfordshire, went to Brittany in 1840, and finally settled at Marseilles. After his wife's death in 1874 he burnt the MSS. of tragedies and poems that would have filled eight or ten volumes; but when a revised edition of *Joseph* had been published in 1876, the old man was moved to write some additional scenes for his *chef-d'œuvre*, which Edmund Gosse described as 'an overgrown specimen of the pseudo-Jacobean drama in verse popular in ultra-poetical circles between 1820 and 1830,' to be regarded less as a play than as a poetical curiosity of florid eloquence and rich versification.

See Buxton Forman in Miles's *Poets of the Century*; Linton's edition of *Stories after Nature* (1891); and reprint of *Joseph and his Brethren* (1908), with introduction by Swinburne and note by Watts-Dunton.

Wells, HERBERT GEORGE, born in 1866 at Bromley, Kent, a professional cricketer's son, from trade and teaching turned to journalism and letters. He took a London B.Sc. degree (with first-class honours) in 1888, and in 1893 published a text-book of Biology. In a series of scientific romances he gave vent to an exuberant imagination, *The Time Machine* (1895) being followed by *The Island of Dr Moreau, The War of the Worlds, The First Man in the Moon,* and similar fantasies, besides no less popular volumes of short stories, the pick of which were collected later in *The Country of the Blind* (1911). With the dawn of the new century Mr Wells began to apply his pen to more serious tasks. Mars and the Year Million yielded place to cockney London in *Love and Mr Lewisham,* and *Kipps* (1905), and to present-day England in *Tono-Bungay* (1909), and *Mr Polly.* In *The New Machiavelli* (1911) and subsequent novels up to the outbreak of the Great War Mr Wells grew more and more didactic and introspective, more critical of life, more intent on voicing his sociological views. An ex-Fabian, he expounded his theories and aspirations in such treatises as *A Modern Utopia* (1905) and *An Englishman Looks at the World* (1914). War-time problems—education, religion, and what not—are dealt with in *Mr Britling Sees it Through* (1916), *Joan and Peter, The Undying Fire,* and other absorbing, if discursive, novels; and in an *Outline of History* (1920) Mr Wells found a vast expository undertaking after his own heart, in his own words, 'replacing narrow nationalist history by a general view of the human record.' He acted as special correspondent during the Washington Conference, but then returned to novel-writing with *Men like Gods, Christina Alberta's Father,* and *World of William Clissold* (3 vols. 1926), the last being used chiefly as a vehicle for the author's speculations on all manner of subjects. *Meanwhile* (1927) deals with the question of strikes.

A collected edition of Mr Wells' works was published 1925 *et seq.* See Studies by Beresford (1915), Ivor Brown (1923), and Bibliography by his son, G. H. Wells (1926).

Wels, a town of Upper Austria, on the river Traun, about 16 miles SW. of Linz, with an interesting church (dating partly from the 9th century, but mostly from the 15th), an old castle, town-hall, and park. There are manufactures of machinery, paper, oil, leather, and copper and brass goods. Pop. 16,400.

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Welser, the name of a famous family of German merchants, which first came into prominence in Augsburg in the 13th century, but rose into international importance during the 15th century. An extensive trade was carried on, too, with the Levant and the East. Bartholomew Welser (1488–1561) lent money to Charles V. and financed the expedition to Carácas, Venezuela; a niece, Philippine (1527–80) married the Archduke Ferdinand, second son of Ferdinand I.; a grand-nephew, Marcus (1558–1614) was distinguished for his writings.

Welsh, JANE. See CARLYLE (THOMAS).

Welsh, or WELCH, JOHN (*c.* 1568–1622), Presbyterian divine, was born at Colliston, Dumfriesshire, and was appointed minister at Selkirk in 1589, at Kirkcudbright in 1595, and at Ayr in 1600. He was imprisoned by James VI. in 1605, and banished the next year, whereupon he preached to Huguenot congregations at Nérac, Jonsac, St Jean d'Angely. He died in London. See Life by Young (1866).

Welsh. See WALES.

Welshpool, a town of Montgomeryshire, till 1918 one of the six Montgomeryshire boroughs, near the Severn, 20 miles W. by S. of Shrewsbury, with a town-hall, market (1873), and museum (1874). A mile south is Powis Castle (12th c.), with a fine picture-gallery and park—long the seat of the Herberts. Pop. (1921) 5677.

Welwitschia (named after Friedrich Welwitsch, Austrian traveller, 1806–72), a genus of African Gymnosperms (q.v.) belonging to the Gnetaceæ (see SEA-GRAPE), and containing only one species (*W. mirabilis*), found in southern Mossamedes and near Welwitsch railway station in South-west Africa, where South Africa continues the government protection accorded to it by Germany. The stem of this remarkable plant may when mature be little over a foot high but several feet across. It bears but two leaves (after the cotyledons), which sometimes grow to be 5 or 10 feet long and 2 or 3 wide, ultimately splitting into strips and getting buried in the desert sands. The plant is said to live over 100 years. It is monœcious, males predominating. The panicled flowers are covered by brilliant overlapping scarlet scales.

Welwyn Garden City, in Hertfordshire, some 6 miles W. of Hertford and 21 miles N. of London, is the first of the Satellite Towns (q.v.) of London. Welwyn City, which is finely situated in uplying country, was founded in 1920, and has a population of about 6000. Urban powers were granted in 1927.

Wem, a market town of Shropshire, on the Ellesmere Canal, 11 miles N. by E. of Shrewsbury. Hazlitt lived here. Pop. of urban district (1921) 2176.

Wembley, an urban district of Middlesex in the Harrow parliamentary division, about 10 miles NW. of St Paul's Cathedral; pop. 16,191. In a park of 220 acres the British Empire Exhibition was held here in the summers of 1924 and 1925. The scheme to promote interest in and knowledge of the empire in all its aspects—commercial, social, scientific, artistic—was launched in 1920, and building began in 1922. The exhibition included the palaces of engineering, industry, arts, the British government building, pavilions furnished by the great dominions and colonies, also a huge stadium capable of accommodating nearly 100,000 people, and an amusements park.

Wemyss, FRANCIS WEMYSS CHARTERIS DOUGLAS, EARL OF, a father of the volunteer movement, was born 4th August 1818 and educated at Eton and Christ Church, Oxford. He sat in Parliament for a division of Gloucestershire in 1841–46, followed

Sir Robert Peel on the repeal of the Corn Laws, and sat for Haddingtonshire as a Liberal Conservative from 1847 till in 1883 he succeeded his father as ninth earl. As Lord Elcho he was a Lord of the Treasury in the Aberdeen Ministry from 1852 till 1855. He took a very prominent part in the volunteer movement, frequently presided over the rifle meetings at Wimbledon, and wrote *The New War Office* (1899). He died 30th June 1914.

Wenceslaus (WENZEL), (1361–1419), German king, was born at Nürnberg, son of the Emperor Charles IV., and was crowned king of Bohemia in 1363, and king of the Romans in 1376. His father died in 1378. Wenceslaus—an able and intelligent man, but apt to let things slide, and addicted to drunkenness—proved unequal to the task of subduing the power of the nobles and restoring order. He attempted with Charles VI. of France to end the papal schism, but in 1400 he was deposed by a majority of the electors, Rupert of the Palatinate (died 1410) being chosen as his successor, followed in 1411 by Sigismund (q.v.), half-brother of Wenceslaus. The latter's tenure of the Bohemian throne was marked by quarrels with Sigismund. Wenceslaus was sympathetic to the teachings of Huss (q.v.).

Wen-chow (*Wan-chau*), a Chinese treaty port in the province of Cheh-kiang, at the head of a bay or estuary, with an export of tea and timber; pop. 200,000.

Wendover, a village and parish of Bucks, under the Chiltern Hills, 5 miles SE. of Aylesbury. It sent members to parliament till 1832. For Roger of Wendover, a monk of St Albans, who died 1236, see PARIS (MATTHEW).

Wends, a branch of the Slavs (q.v.) which, as early as the 6th century, occupied the north and east of Germany from the Elbe along the Baltic coast to the Vistula, and as far south as Bohemia. They were divided into several tribes, which were successively subdued by the Germans, and either extirpated or gradually Germanised and absorbed more or less perfectly. In a narrower sense the name of Wends is given to those remnants of the Slavic population of Lusatia (q.v.) who still speak the Wendish tongue, and preserve their peculiar manners and customs. Of these Lusatian Wends or Sorbs, Upper and Lower, there were in 1889 in Saxony 56,000, in Prussia 103,000. Outside Lusatia there were 3400 in Saxony, 1000 in Prussia, 3000 in foreign parts.

Of the language there are grammars by Seiler (1830), Jordan (1841), F. Schneider (1853), Pfuhl (1867), and Liebsch (1884); dictionaries by K. Bose (1840), Zwahr (1847). Schmaler's *Volkslieder der Wenden* (2 vols. 1843) is more trustworthy than Veckenstedt's *Wendische Sagen, Märchen,* &c. (1879). See also L. Giesebrecht, *Wendische Geschichten aus den Jahren 780–1182* (3 vols. 1841–43); R. Andree, *Das Sprachgebiet der Lausitzer Wenden* (1873); Schulenberg, *Wend. Volkstum* (1882); and Mucke, *Statistik der Lausitzer Wenden* (1886).

Wener, LAKE. See VENER.

Wenlock, a municipal borough of Shropshire, extending over more than 35 sq. m., and comprising Much Wenlock, Broseley (q.v.), Coalport, Madeley, Ironbridge, and Coalbrookdale (q.v.). It was incorporated by Edward IV. in 1448, and till 1885 returned two members to parliament. Much Wenlock, under the north-east end of Wenlock Edge, 12 miles SE. of Shrewsbury, has a magnificent guild-hall (restored 1848), a market-hall (1879), a corn exchange (1852), a museum, and interesting remains of a Cluniac abbey, originally founded as a nunnery about 680 by Penda's granddaughter, St Milburga, and refounded in 1080 by Roger de Montgomery, Earl of Shrewsbury. Pop. of borough (1861) 19,699; (1921) 13,712. For the Wenlock group in geology, see SILURIAN SYSTEM.

Wens, or SEBACEOUS CYSTS, are much more common on the scalp than in any other situation, though occasionally observed on the face, shoulders, &c., and consist of obstructed sebaceous glands, which enlarge by the internal pressure of their accumulated secretions. They are never of very large size; but several or many often occur in the same patient. The closed orifice may often be noticed in the form of a small dark depressed point, and in that case the duct may sometimes be gradually enlarged by the gentle introduction of a probe or director, and its contents pressed out. By this treatment wens may at all events be kept from being unsightly, and will sometimes shrivel up and disappear. If it fail, and the patient finds the tumour so annoying that he insists upon its removal, it must be opened and the lining membrane must be carefully dissected out or thoroughly scraped away, or the interior may be wiped out with pure carbolic acid. If the lining membrane be not thoroughly destroyed, the cyst is liable to refill. When it is completely cleared out the sides collapse and grow together, the cavity disappearing. The operation is slight and is not dangerous under careful antiseptic precautions.

Wensan. See GENSAN.

Wensleydale Peerage. In 1856 Sir James Parke (1782–1868), a judge of the Court of Exchequer, was created a life-peer, in accordance with an ancient but, it was maintained, wholly obsolete usage. The resolution of the House of Lords, led by Lord Lyndhurst, not to receive the new baron, led to his being given a peerage of the usual kind (it died with him). There are, however, a number of official life-peers—the Lords of Appeal in Ordinary.

Wentletrap (*Scalaria*), a genus of Gasteropods related to the Turritellidæ. The elegant shell is spiral, with many whorls, the whorls deeply divided, and not always close together, crossed by remarkably elevated ribs, the aperture round and rather small. The colour is usually lustrous white. Scalaria is a predaceous Gasteropod, ranging from the shore to a depth of 100 fathoms. About 100 species of the genus are known. Those which have the whorls close together are called False Wentletraps by shell-collectors, those in which they are not contiguous are known as True Wentletraps. Of the former some are found in northern seas, as *Scalaria communis* on the coasts of Britain and of continental Europe, and *S. grœnlandica* on those of North America. The *true* wentletraps are all natives of the seas of warm climates. A species found in the south-east of Asia, and known as the Precious Wentletrap (*S. pretiosa*), was once in such esteem amongst shell-collectors that an extremely fine specimen is said to have been sold for 200 guineas; and an ordinary price was from three to five pounds. The shell may now be purchased for a few shillings.

Wentworth. See STRAFFORD, ROCKINGHAM.

Wepses. See TSCHUDES.

Werdau, a town of Saxony, on the river Pleisse, 45 miles S. of Leipzig by rail, with manufactures of cloth and machinery; pop. 19,000.

Werden, a town of Rheinland, on the Ruhr, 16 miles NE. of Düsseldorf by rail, with cloth manufactures and an interesting church (1257–75); pop. 13,000.

Werfel, FRANZ, German poet and dramatist, was born of Jewish parents at Prague in 1890, and has lived a good deal in Vienna. His work includes, in poetry, *Der Weltfreund* (1912), *Einander* (1915), and a selection *Gesange aus den drei Reichen* (1917); in drama, a version of the *Trojan Women* of Euripides (1915), the magical trilogy *Der Spiegelmensch* (1920), the legend

Paulus unter den Juden (1926); and the novel *Verdi* (1924), which analyses the artistic aims of the composer, Verdi. In his poetry Werfel is an apostle of Expressionism (q.v.), while his plays are strongly dramatic and skilfully constructed.

Wergeland, Henrik (1808–45), lyric poet. See Norway (*Literature*).

Wergild, or Weregild (O.E. *wer*, 'man,' and *geld, gield, gyld*, 'payment,' 'tax,' or 'satisfaction'), a composition by which, by the custom of the English, Franks, and other Teutonic peoples, homicide and other heinous crimes against the person were expiated. There was an established progressive rate of wergild for homicide, varying at different times and among different Teutonic tribes, from the wergild of the *ceorl* or peasant to that of the king. In Anglo-Saxon times the value of the king was 7200 shillings; an ealdorman, 2400; a king's *thegn*, 1200; an ordinary territorial *thegn*, 600; a *ceorl*, 200. In the time of Tacitus the wergild for homicide among the Germans was due to the relatives of the deceased; that for other crimes one-half to the injured party and one-half to the state. The sum paid to the relatives in case of homicide, also known as the *man-wyrth*, seems to have been looked on as the equivalent of the dead man's value. As the power of the community or king increased, the exaction of retribution for the death of its members was considered to be the duty of the state as well as of the relatives, and the principle of division was applied to homicide as well as minor crimes; each payment being a separate full equivalent for the value of the deceased, the one to appease the feud, the other to make atonement to the state. This double wergild is recognised in the compensation for the death of a king by the laws of the Mercians and Northumbrians. In the days of Edward the Elder the wergild had become a much more complicated penalty, the composition for homicide consisting of four different payments, two of which, the *fight-wite* (*fyht-wite*), or penalty for a breach of the peace, and the *wergild*, went to the king as head of the state; while a sum called the *halsfang* was paid to the kindred to stay the hand of the avenger of blood, and the *manbót* was given to the overlord to compensate him for the loss of a vassal. The graduated scales of wergild in use among the different Teutonic nations throw much light on the gradations of society at the period. It does not appear that among the nations who recognised the principle of wergild the relatives were bound to accept a compensation for their kinsman's slaughter, in place of appeasing the death-feud by blood; the latter practice was often resorted to instead. It was only through the exertions of Archbishop Theodore that Egfred, the Christian king of the Angles of Northumbria, adopted the alternative of accepting a wergild for his brother slain in battle by the Mercians, in place of demanding the blood of the slayer. See Vendetta, Criminal Law.

Wermelskirchen, a town of Rheinland, Germany, 20 m. SE. of Düsseldorf, with cotton, silk, tobacco, and steel factories; pop. 15,500.

Werner, Abraham Gottlob, mineralogist and geologist (1750–1817). See Geology, p. 152.

Werner, E., pseudonym of Elisabeth Bürstenbinder, a novelist who, born in Berlin in 1838, attained eminence as a writer of novels and stories, of which *Sacred Vows*, *Fickle Fortune*, *Riven Bonds*, &c., have been translated into English. She died at Meran in 1908.

Werner, Friedrich Ludwig Zacharias, dramatist, was born at Königsberg, 18th November 1768, studied at the university there, and in 1793–1805 was in the Prussian civil service. As author of a series of dramas he became founder of a side branch of the Romantic school, that of the mysterious and extravagant 'fate-tragedies.' He was thrice married and thrice separated by divorce, entered the Catholic Church at Rome in 1811, and died a priest at Vienna, 17th January 1823. His chief works are *Die Söhne des Thals* (1803), *Das Kreuz an der Ostsee* (1804), and *Martin Luther* (1806). See the long essay in Carlyle's *Miscellanies*. There are biographies by Hitzig (1823), Schülz (1841), and Düntzer (1873).

Wernigerode, a town of Prussia, at the northern foot of the Harz Mountains, 50 miles SW. of Magdeburg, with a museum, an old castle, and town-hall; pop. 20,000.

Werther. See Goethe.

Werwicq, a town of Belgium on the Lys, 9 miles SE. of Ypres, with an old church and tobacco factories. During most of the Great War it was held by the Germans. Pop. 9000.

Werwolf (O.E. *wer-wulf, were-wulf—wer*, 'a man,' *wulf*, 'a wolf.' The modern Ger. *Währwolf* is the Middle High German *Werwolf*. Latinised as *garulphus* or *gerulphus*, it gives the Old Fr. *garoul*, the modern name being pleonastically *loup-garou*). Halliwell-Phillipps quotes from a Bodleian MS. (*Dict. Archaic and Provincial Words*, s.v. 'a-charmed') a characteristic example of folk-etymology: 'Ther ben somme that eten chyldren and men, and eteth noon other flesh fro that tyme that thei be a-charmed with mannys flesh, for rather thei wolde be deed; *and thei be cleped werewolfes for men shulde be war of hem.*' The following passages from Gervase of Tilbury's *Otia Imperialia* and Richard Verstegan's *Restitution of Decayed Intelligence* (1605) give a summary of belief about the werwolf, one of the most uncanny of the creatures of human imagination. 'Vidimus enim frequenter in Anglia per lunationes homines in lupos mutari, quod hominum genus *gerulphos* Galli nominant, Angli vero *were-vulf* dicunt.' 'The wer-wolves are certain sorcerers, who having anointed their bodies with an ointment which they make by the instinct of the devil, and putting on a certain enchanted girdle, do not only unto the view of others seem as wolves, but to their own thinking have both the shape and nature of wolves, so long as they wear the said girdle; and they do dispose themselves as very wolves, in worrying and killing, and most of human creatures.' This superstition was widely spread in ancient and mediæval times, and is still a living fact amongst many savage races, and even in corners of France, not to speak of Russia and Bulgaria. Wlislocki, writing in 1891 (*Journal Gypsy Soc.*), tells us of a gypsy fiddler's wife at Tórész in north Hungary, about ten years before, who kept the family in mutton and enabled her husband to start a thriving inn by her nocturnal ravages as a *ruvanush*. The parson cured the woman by sprinkling her and the house with holy water; the peasants murdered the husband, and two of his slayers were then living in the village. Indeed we may say it is a commonplace of folklore that certain men by natural gift, or magic art, can turn for a time into ravening beasts, which Sir E. Tylor calls 'substantially a temporary metempsychosis or metamorphosis.' And Thomas Aquinas lends the weight of his grave authority to a sound theological explanation: 'All angels, good and bad, have by natural virtue the power of transmuting our bodies.' In various forms of mental disease there is a belief in a similar transformation, but this no doubt presupposes an antecedent sane belief in the possibility of such metamorphoses into animals. These insane delusions have been widely prevalent

at various times in the history of human society, and have given rise to the name of *Lycanthropy*. The wolf is of course not the only animal, although the most common in western Europe. In England he has long been unknown, and the cat and the hare have been largely employed in witch transformations. Herodotus tells us the Neuri turned to wolves for a few days every year. The Khonds of Orissa think some men have the art of 'mleepa,' and by the help of a god become mleepa tigers to kill their enemies, one of the man's four souls going out to animate the beast. The tribe of Budas again in Abyssinia, ironworkers and potters, have also the evil eye and the power of turning into hyænas, whence they are very properly denied the Christian sacrament. In Virgil's 8th Eclogue we read how Mœris makes himself a wolf by means of poisonous herbs, and how he witches away the crops and calls up dead folk from their graves. Petronius Arbiter has a story of the transformation of a *versipellis* or *turnskin*, and here also we find the note so familiar in European stories of werwolves and witches, of how when the wolf is wounded the man who wore his shape is found to bear exactly the same wound, just as those who had been turned into ponies by witches bore the marks of horseshoe nails ever after. We find werwolf warriors of peculiar ferocity in Scandinavian sagas, and to this day in Denmark a man who is a werwolf is recognised by his eyebrows meeting as if his soul were ready to take flight like a butterfly. The change of shape is often effected by taking off the clothes, putting on a girdle, or rubbing with magic salve. Thus the swan-maidens took human form when they laid aside their swan-skins, and it was by stealing the swan-skins that Wayland the smith and Eigill the archer got their swan-maiden wives. Again, in the *Golden Ass*, it was by using the wrong ointment that Lucius was transformed into an ass instead of a bird. During the 16th century France was much infested with werwolves, the trial of Gilles Garnier at Dôle in 1573 being the most famous historical instance; and Olaus Magnus in the same period tells of specially accursed werwolves who were ferocious against the orthodox. But on the other hand we meet a more kindly view in the Bisclaveret of Marie de France's *lai*, and in the romance of *William and the Werewolf*—more in keeping with the usual folklore notion of interchangeable transformation and mutual relationship between the human and the animal world. Probably animal disguises and the acting of animal parts in ritual were not always clearly distinguished from actual transformations.

See Baring-Gould's *Book of Were-wolves* (1865—good examples, but doubtful theories); Hertz's *Der Werwolf* (1862); Elliot O'Donnell's *Werwolves* (1912). See also Sir E. B. Tylor's *Primitive Culture;* also the articles TOTEMISM, VAMPIRE, and WITCHCRAFT.

Wesel, a town of Rheinland, at the confluence of the Lippe with the Rhine, 32 miles NW. of Düsseldorf. It has a handsome town-hall (1390–96), and the fine Gothic church of St Willibrod (15th–16th century, with the nave added in the 19th century), in the choir of which is to be found some beautiful vaulting. There are manufactures of stoneware, metal goods, sugar, &c., and since 1921 a commercial fair has been held annually. Wesel became a member of the Hanseatic League in 1350. The strong inner fortifications were demolished in 1891, the outer in 1921. Pop. (1925) 24,027.

Weser, a river of Germany, formed at Münden out of the Werra and the Fulda; hence it flows north through Prussia, till, passing Bremen, it forms for about 40 miles the boundary between Oldenburg and Prussia, and enters the North Sea by a wide but shallow estuary, after a course of 280 miles. It communicates with the Elbe by a canal.

Wesermünde, a Prussian municipality formed in 1924 by the union of Geestemünde (q.v.) and Lehe (on the other side of Bremerhaven). Pop. (1925) 72,048.

Wesley, CHARLES, John Wesley's brother, was born at Epworth, 18th December 1707, had his education at Westminster of which he became captain and was elected student of Christ Church, Oxford. He was the first Oxford Methodist, 'found rest to his soul' on Whitsunday 1737, and was throughout life indefatigable lieutenant to his greater brother, especially in Bristol and London. He died in London, 29th March 1788. He is said to have written 6500 hymns. The number of books of poetry published by the brothers, in conjunction or separately, 1738–86, was sixty-three. The *Poetical Works* of the two, officially edited for the Wesleyan Methodist Conference, fill thirteen volumes (1868–72). Many of Charles Wesley's hymns are exquisite poetry as well as devotion. It is enough to name 'Jesu, Lover of my Soul,' 'O for a thousand tongues to sing,' 'Hark the herald angels sing,' 'Love Divine, all loves excelling,' and 'O for a heart to praise my God.' There are Lives by Jackson (1841), Telford (1886), Jones (1919); *Journal and Letters*, 2 vols., *Early Journal* (1910).

Wesley, JOHN, was born on June 17 (o.s.), 1703, in Epworth Rectory, his father being the rector of that little Lincolnshire market-town. He was descended from a long line of English gentry and clergy; the Duke of Wellington (q.v.) belonged to a collateral branch of the same family. On the maternal side he was related to the more cultured and refined representatives of English Nonconformity, his mother's father being Dr Samuel Annesley, 'the St Paul of the Nonconformists.' In 1714 John Wesley was nominated on the foundation of Charterhouse School by the Duke of Buckingham. In 1720 he was elected to Christ Church, Oxford, of which House his brothers Samuel and Charles were also members. Wesley soon began to display an extraordinary conscientiousness and an ascetic tendency; Thomas à Kempis and Jeremy Taylor had much influence over him. He finally resolved to enter the church, and was ordained deacon in Christ Church Cathedral in 1725, and admitted to priest's orders in the same place in 1728. In 1726 he was unanimously elected fellow of Lincoln College, and in the same year he was chosen Greek lecturer and moderator of the classes. In 1727 he left Oxford to assist his father, but returned in 1729, becoming a zealous tutor. During his absence his brother Charles and two or three other young men began to attract special attention by what was at that time regarded as a quite fanatical religious earnestness. A young gentleman of Christ Church, struck by the exact regularity of their lives and studies, exclaimed, 'Here is a new sect of Methodists sprung up.' Many years after, Wesley defined a Methodist as one who arranges his life according to 'the method laid down in the New Testament.' The two Wesleys, James Hervey, and George Whitefield were the most distinguished of the Oxford Methodists. In 1732 Wesley formed the personal acquaintance of William Law, and was for a time much influenced by mystical theology. In 1735 Wesley's father died, and in the same year Wesley undertook a mission to Georgia under the direction of the Society for the Propagation of the Gospel. At that time Wesley was a High Churchman of the most rigid type. He had two daily services. He divided morning prayer, taking the Litany as a separate office. He inculcated severe fasting and

confession before communion. He made a point of celebrating the holy communion weekly. He even refused the communion to all who were not episcopally baptised. He insisted upon baptism by immersion. He rebaptised the children of Dissenters. He refused to bury all who had not received Episcopalian baptism. At this moment in his career he seemed to be on the point of anticipating the work of Cardinal Newman by a century. But events were about to happen which would take him ultimately to the opposite pole of the ecclesiastical world. On his voyage to Georgia he had been greatly impressed by the perfect fearlessness of the Moravians when in momentary danger of shipwreck. His irritating ecclesiastical intolerance, and an unfortunate love-affair, produced strife and misunderstanding, and he returned to England in 1738. In London he met the Moravian missionary, Peter Böhler, and after much prayerful intercourse with him, was convinced that Christian faith was not an intellectual acceptance of orthodox opinions, but a vital act, and afterwards a habit of soul by which man, under the supernatural impulse of the Spirit of God, trusts in Christ, enters into living union with Christ, and then abides in Christ, so that he no longer lives, but Christ lives in him, as the vine lives in the branch, and as the controlling mind lives in the body. Then came the ever memorable 24th of May 1738, when Methodism as history knows it was born. The decisive moment is described in his *Journal:*

'In the evening I went very unwillingly to a society in Aldersgate Street, where one was reading Luther's preface to the Epistle to the Romans. About a quarter before nine, while he was describing the change which God works in the heart through faith in Christ, I felt my heart strangely warmed. I felt I did trust in Christ, Christ alone, for salvation, and an assurance was given me that He had taken away *my* sins, even *mine*, and saved *me* from the law of sin and death. I began to pray with all my might for those who had in a more especial manner despitefully used me and persecuted me. I then testified openly to all there what I now first felt.'

The Rubicon was crossed. The sweeping aside of ecclesiastical traditions, the rejection of Apostolical Succession, the ordination with his own hands of presbyters and bishops, the final organisation of a separate and fully-equipped church, were all logically involved in what took place that night. It is difficult for us to realise now the heathen condition of England at that time; no language can describe the degradation of the masses of the people. The clergy unwittingly rendered a great service by closing their pulpits against Wesley; their intolerance, the example of Whitefield, and the needs of men drove him into the open air. He made the great innovation first at Bristol, where he preached to 3000 persons. England has never seen anything like his open-air work. During his itinerary of half a century 10,000, 20,000, and even 30,000 people would come together and wait patiently for hours until the great evangelist appeared on horseback upon the scene. He bestowed little labour either upon fashionable localities or upon sparsely populated agricultural districts. He gave his time and strength to neighbourhoods where the working-class abounded; hence the mass of his converts were colliers, miners, foundrymen, weavers, spinners, fishermen, artisans, yeomen, and day-labourers in towns. He never journeyed less than 4500 miles in one year; he always rose at four and preached at five, as well as two or even three times later. Until his seventieth year all his journeys were done on horseback, and he rode sixty or seventy miles day after day, as well as preached several times. Terrible persecutions broke out, and his life was frequently in danger; but he completely outlived all persecution, and the itineraries of his old age were triumphal processions from one end of the country to the other. During the fifty years of his unparalleled apostolate he travelled 250,000 miles and preached 40,000 sermons. Yet he managed to do a prodigious amount of literary work.

He wrote short grammars in the English, French, Latin, Greek, and Hebrew languages; a Compendium of Logic; extracts, for use in Kingswood School and elsewhere, from Phædrus, Ovid, Virgil, Horace, Juvenal, Persius, Martial, and Sallust; a complete English Dictionary; commentaries on the whole of the Old and New Testaments; a short Roman History; a History of England from the earliest times to the death of George II.; a concise Ecclesiastical History, from the birth of Christ to the beginning of the last century, in 4 vols.; a Compendium of Social Philosophy, in 5 vols.; a Christian Library, consisting of extracts from all the great theological writers of the universal church. This library of 50 vols. was prepared especially for the benefit of his itinerant preachers, and consisted of representative selections from all the leading writers, ancient, mediæval, Puritan, and modern. In addition to this he prepared many editions of the *Imitation of Christ*, and of the principal works of such writers as Bunyan, Baxter, Principal Edwards, Rutherford, Law, Madame Guyon, and others; endless abridged biographies; and, singularly enough, an abridged edition of a famous novel of the time, Brooke's *Fool of Quality, or The History of Henry, Earl of Moreland.* He also wrote a curious book, which he entitled *Primitive Physic, or an Easy and Natural Method of Curing most Diseases.* He further prepared numerous collections of psalms, hymns, and sacred songs, with several works on music and collections of tunes. In addition, he published his own *Sermons* and *Journals*, and started in 1778 a monthly magazine which still exists. His works were so popular that, to use his own language, he 'unawares became rich.' He made not less than £30,000, every penny of which he distributed in charity during his life.

In addition to his literary and evangelistic work Wesley was a great philanthropist. He founded an orphans' home at Newcastle, charity schools in London, and a dispensary in Bristol. One of the most curious delusions that has ever persisted in Christendom is the notion that he continued to be theologically or ecclesiastically a High Churchman. There is much more ground in his later career for the contention of Dean Stanley that he was the founder of the Broad Church. Under his direction the Conference in 1770 adopted resolutions which produced an outburst of furious indignation on the part of his orthodox Calvinistic friends. These resolutions stated explicitly that the heathen who had never heard of Christ could be saved if they feared God and worked righteousness according to the light they had. On another occasion he wrote in his *Journal* that he had been reading the meditations of Marcus Aurelius, and that he was no doubt one of the 'many' who would 'come from the east and the west and sit down with Abraham, Isaac, and Jacob' in the kingdom of God, while nominal Christians were 'shut out.' He spoke in the strongest terms of the 'execrable wretches' who wrangled at the various church councils, and actually added: 'Surely Mohammedanism was let loose to reform the Christians! I know not but Constantinople has gained by the change.' On the other hand, he spoke of Ignatius Loyola as one of the greatest of men. As early as 1745 he expressed the conviction that bishops and presbyters are essentially one order, and that originally every Christian congregation was a church independent of all others. From this conviction he never departed. When in 1784 he ordained presbyters and a bishop for America, his brother Charles, who did retain High Church convictions, wrote the most earnest expostulations. To these John Wesley replied in the following sentences: 'I firmly believe I am a scriptural *ἐπίσκοπος* as much as any man in England or in Europe; for the uninterrupted succession I

know to be a fable, which no man ever did or can prove.' In harmony with these convictions he himself ordained ministers for Scotland, for the colonies, and ultimately for England. No doubt he greatly loved the church in which he was born, and deeply deplored the providential circumstances which compelled him to vary more and more from her doctrines and practices. He took upon himself with the utmost reluctance the responsibility of organising a separate church. But the most striking feature of his life as a theologian was his readiness in the last resort, whatever it cost him, to adapt his creed to indisputable facts. The keynote of his career is found in the characteristic exclamation, 'Church or no church, the people must be saved.' He died 2d March 1791, in the eighty-eighth year of his age.

See the Life by Tyerman (3 vols. 1870; 6th ed. 1890), and those by Coke and Moore (1792), Whitehead (1793), Southey (1820), Moore (1825), Wedgwood (1870), Urlin, Rigg, Telford (1886; 4th ed. 1924), Overton (1891), Kirton, Bevan, Green (1905), Fitchett (1906), Winchester (1906), Dean Hutton (1927), and others. There are Lives of Samuel Wesley, father of John and Charles, by Tyerman (1866); of their mother, by Kirk (1866), Clark (1886), Brailsford (1910); and of the Wesley family, by Adam Clarke (1836), and Stevenson (1876); *Wesley Anecdotes* by Wakeley, and by Telford (1885). See also Charles's Journal, and especially the standard edition of John Wesley's Journal, for the first time fully deciphered and edited by Curnock (1909 *et seq.*); *Standard Sermons*, edited and annotated by Dr. E. H. Sugden (1921). His *Letters* numbering about 2600 are being printed (1927). For the origin, doctrines, and present condition of the Methodist societies, see METHODISM. A tablet commemorating the conversion of the brothers was unveiled outside St Botolph's, Aldersgate Street, on 24th May 1926, and John Wesley's bust at Lincoln College, Oxford, 28th March 1926.

Wesley, SAMUEL (1766–1837), younger son of Charles Wesley, was born at Bristol, showed precocious development in music, but an accident in 1787 made him subject to a peculiar mental malady. Still, he was accounted the greatest organist of his day, and was an ardent Bach enthusiast. His religious compositions, which comprise four masses —he joined the Roman Catholic Church in 1784 but withdrew a few years later — and various Anglican anthems and services, show great power and vitality.

Wesley, SAMUEL SEBASTIAN (1810–76), son of Samuel Wesley, was born at London, held various posts as organist, notably at Hereford, Exeter, Winchester, and Gloucester cathedrals, and was considered a brilliant performer. His compositions, all for Anglican ritual, are cultured and devotional without being formal or conventional, and are still frequently performed.

Wessel, JOHANN (also known as *Gansfort*), a reformer before the Reformation (1420–89), was born at Groningen, educated amongst the Brethren of the Common Life, and taught philosophy at Cologne, Louvain, Heidelberg, and Paris. A humanist by training, he based his theology on the Bible directly, and was revered by his disciples as *Lux Mundi*. See monographs by Ullmann (embodied in *Reformatoren vor der Reformation*, 1866), Friedrich (1862), Dödes (in *Studien u. Kritiken*, 1870), Miller, *Wessel Gansfort* (principal works trans. Scudder, N.Y. 1917).

Wessex, one of the Saxon kingdoms of England, situated between Watling Street and the English Channel. The early history is obscure. According to the Saxon Chronicle, Saxons, called *Gewissas*, made various landings after 495 A.D. on the shores of Southampton Water, and were soon reinforced by Jutes, with whom they coalesced under their king, Cerdic (519–34), becoming known as the West Saxons. They quickly overran the modern Hampshire, and Wight, and the next king, Cynric (534–60), seized Salisbury Plain, and forced his way to the Thames, only to find his progress eastward barred by the Middle Saxons. Some modern authorities, however, suggest that the original invasions came from the east. Ceawlin (560–92) pushed back the Jutes of Kent, then turned northwards, seizing the valleys of the Thame and Cherwell, next the Severn, and in 583 destroyed the old Roman station of Uriconium. But further progress northwards was checked by the defeat at Faddiley and by long internal dissensions. Next Mercia took their possessions north of the Thames and the Somersetshire Avon. In 635 Wessex accepted Christianity, next under Cenwealh (643–72) it extended its western border from the Axe to the Parret, under Ine (688–726) beyond the Parret, and under Cuthred (741–54) it threw off the Mercian yoke. Offa in 779 again pushed them to the Thames, but they now turned westwards and made themselves masters of Devon. From this time their influence constantly grew until in Egbert, under whom they reached to the Tamar, they rose to the lordship of the other kingdoms and states, and began the history of England. See EGBERT, and ENGLAND. See also HARDY (THOMAS).

West, BENJAMIN, painter, was born at Springfield, Pennsylvania, 10th October 1738, of Quaker parentage, and, though lacking all encouragement, surprised his friends by his skill in drawing at the age of seven years, and at nine painted a picture in water-colours, which in after life he declared he had in some respects never surpassed. His first colours were made from leaves, berries, &c., and his brushes hairs stolen from a cat's tail. Thus self-taught, at the age of sixteen he practised portrait-painting in the villages near Philadelphia, and painted for a gunsmith his first historical picture, 'The Death of Socrates.' At eighteen he was painting portraits in Philadelphia, and later at New York, where in 1760 he was aided by some generous merchants to go and pursue his studies in Italy. At Rome he was patronised by Lord Grantham, whose portrait he painted, became the friend of Raphael Mengs, and as the first American artist ever seen in Italy attracted much attention. He painted his 'Cimon and Iphigenia' and 'Angelica and Medora,' and was elected member of the Academies of Florence, Bologna, and Parma. In 1763, visiting England on his way to America, he was induced to remain in London, and in 1765 married Eliza Shewell, to whom he had been engaged before leaving America. His 'Agrippina landing with the ashes of Germanicus' attracted the attention of George III., who was his steady friend and patron for forty years, during which time he sketched or painted 400 pictures. His 'Death of General Wolfe,' painted in the costume of the period, against the advice of all the most distinguished painters, effected a revolution in the historic art of Britain. For the king he painted a series of 28 religious pictures for Windsor Castle. Among his best-known works are 'Edward III. at Cressy,' 'The Black Prince at Poictiers,' 'Queen Philippa at Calais,' 'Penn's Treaty with the Indians,' 'Christ healing the Sick,' 'Death on the Pale Horse,' and the 'Battle of La Hogue. In 1792 he succeeded Sir Joshua Reynolds as the President of the Royal Academy, but declined the honour of knighthood. He attained very great contemporary fame, his drawing being correct and his composition skilful, though the colouring is a monotonous and dull reddish brown. Through his whole career he was the generous friend, adviser, and patron of young artists. He died in London, March 11, 1820, and was buried with great pomp at St Paul's Cathedral. His wife died 1817. Two sons survived him.

There is a Life of him (not good) by John Galt (1820), and another in Allan Cunningham's *Lives;* the best authorities are Dunlap's *History of Arts in the United States* (New York, 1834), C. E. Lester's *Artists of America* (1846), and H. T. Tuckerman's *Book of the Artists* (1867).

West Bay City. See BAY CITY.

Westboro, a small manufacturing town of Massachusetts, 32 miles by rail W. by S. of Boston, with a state reform school; pop. 4000.

West Bromwich, a parliamentary, municipal, and county borough of Staffordshire, one of the most important towns in the great manufacturing and mining district known as the 'Black Country.' It is 5½ miles NW. of Birmingham, 90 SSE. of Liverpool, 93 NNE. of Bristol, and 113 NW. of London. The *Bromwic* of Domesday, and the seat in the 12th century of a Benedictine priory, it yet is of modern growth, having risen within the last hundred years from a mere village on a barren heath, in consequence mainly of the rich coal and iron mines in the vicinity, of the industries to which these give rise, and of the transport facilities by rail and canal. The public buildings, erected in 1875, comprised a town-hall with a fine organ, a tower 130 feet high, a market-hall, free library, &c., but the market-hall and library have been converted into council chambers, offices, &c. (1924). A new public library, presented by Carnegie, was opened in 1905. There are also the institute (1886), All Saints Church (rebuilt 1872), Christ Church (1829), with a tower 114 feet high and twelve bells, the law courts (1891), the West Bromwich district hospital (1867–82), and several public parks. The largest of the parks, one of 65 acres, was presented to the town in 1919 by the Earl of Dartmouth, whose ancestor purchased the manor in 1823, it having previously been held by Stanleys, Clarke-Jervoises, &c. The manufactures comprise all departments of hardware, as cast-iron hollow-ware of all descriptions, axles, axle-trees, locks, springs, fire-irons, fenders, safes, cooking-ranges, gas-stoves, nails, rivets, &c. Iron and steel tube-making, optical glass and sheet-glass making, printing, and coal-mining, are also carried on to a great extent. By the Reform Act of 1867 West Bromwich was included within the parliamentary borough of Wednesbury, but since 1885 it has returned a member by itself. It was made a municipal borough in 1882 and a county borough in 1888. Pop. (1801) 5687; (1841) 26,121; (1881) 56,295; (1921) 73,761.

Westbury, a little market-town of Wiltshire, 16½ miles SSE. of Bath and 25 NW. of Salisbury, returned till 1832 two members to parliament, and then till 1885 one. It is a railway centre, with large engine sheds, and manufactures cloth, gloves, and glacé kid. The fine Perpendicular church has memories of Mackonochie. Westbury White Horse, cut out on the southern slope of Westbury Down (775 feet), is 175 feet long, and was restored in 1778 and 1853. It probably commemorates Alfred the Great's victory of Ethandún (Edington) over the Danes in 878 (see WHITE HORSE). Pop. (urban district) 3700.

Westbury, RICHARD BETHELL, BARON, was born at Bradford-on-Avon, the son of a Bristol physician, 30th June 1800. He had his schooling at Corsham, near Bath, and at Bristol, at fourteen entered Wadham College, Oxford, and was just eighteen when he graduated with a first-class in classics and a second in mathematics. Soon after he was elected to a fellowship in his college, and in 1823 he was called to the bar at the Middle Temple. His industry, acuteness, and audacity quickly brought him a large practice, and made him by 1841 the leader of the Chancery bar with an annual income of over £20,000. He became Q.C. in 1840, was returned as an advanced Liberal for Aylesbury in 1851, for Wolverhampton at the general election of 1852. Already in 1851 Vice-chancellor of the duchy of Lancaster, he became Solicitor-general in 1852, Attorney-general in 1856, and in 1861 succeeded Lord Campbell on the woolsack, taking his title from Westbury in Wiltshire. In the House of Commons he had borne the burden of several important measures of law reform—the Succession Duty Bill, the Probate and Administration Bill (1857), the Divorce and Matrimonial Bill, the Fraudulent Trustees Bill, and the Bankruptcy and Insolvency Bill (1861). His ideas about legal education were too comprehensive for his contemporaries, but induced the various Inns of Court to consolidate their rules. Unsuccessful also were his schemes for revising and codifying the statutes, and for putting an end to the separation between law and equity—a consummation effected by Lord Selborne which Westbury died a fortnight too soon to see. He delivered the judgment of the judicial committee of the Privy-council on the appeals in the 'Essays and Reviews' cases, and in the debate in the House of Lords employed the unwonted artillery of raillery and irony against Wilberforce and the whole bench of bishops. In 1865 Westbury was compelled to resign office through the clamour against some official appointments, but the chancellor was personally acquitted of unworthy motives. He opposed Gladstone's Irish Church Bill, and still more the Irish Land Act of 1870, and gave the last year of his life to arduous labour as arbitrator of the European Assurance Society. He died in London, July 20, 1873. Lord Westbury's acuteness of intellect was indeed great, but did not justify his merciless use of the weapon of sarcasm, and that of the bitterest. But he has had his reward. Though a zealous reformer and great lawyer, with a rare faculty of piercing quickly to the heart of his subject, he is already remembered only by a few stories and sayings, and these not all authentic. See Life by Nash (1888), and Atlay, *Victorian Chancellors* (1908).

West Calder, a mining-town of Midlothian, 16 miles WSW. of Edinburgh; pop. 3000.

West Chester, capital of Chester county, Pennsylvania, 27 miles by rail W. of Philadelphia, with foundries, machine-shops, factories; it is the centre of a rich farming country; pop. (1920) 11,717.

Westcott, BROOKE FOSS, a great New Testament scholar, was born near Birmingham in 1825, and, like Lightfoot, Hatch, and Benson, had his schooling under Prince Lee at King Edward's School, Birmingham, whence he passed to Trinity College, Cambridge. He carried off the Battie university scholarship, the medal for the Greek ode twice, the Bachelor's prize for the Latin essay twice, the Norrisian prize (1850), and in 1848 was bracketed first classic. Elected fellow of his college in 1849, he took orders in 1851, and was an assistant-master at Harrow from 1852 till 1869, when he became a canon of Peterborough. He was appointed regius professor of Divinity at Cambridge in 1870, chaplain-in-ordinary to the Queen in 1879, canon of Westminster in 1883, and in 1890 succeeded his friend Lightfoot in the bishopric of Durham. He died on the 27th July 1901. The D.D. of his own university (1870) was followed by the Oxford D.C.L. (1881), and other academic honours. He was one of the company for the revision of the Authorised Version of the New Testament, and his views are known to have had the greatest influence in the deliberations. His edition of *The New Testament*

in Greek was published in 1881, the result, conjointly with Dr Hort, of the labours of twenty-eight years. The first volume contained the text, the second the introduction. Manuals of the greatest value, no less for their learning than their clearness of style, are *General Survey of the History of the New Testament Canon* (1855) and *An Introduction to the Study of the Gospels* (1860). No less admirable summaries of knowledge are *The Bible in the Church* (1864) and *A General View of the History of the English Bible* (1868). His commentaries are upon the Gospel of St John (*Speaker's Commentary*, 1882), the Epistles of St John (1883), and the Epistle to the Hebrews (1889). He published also sermons, and *Essays on the History of Religious Thought in the West* (1891). See Life by his son (1903) and a book by Claughton (1906).

Westerly, a town of Rhode Island, on the Pawcatuck River, 44 miles SSW. of Providence, with woollen mills, printing works, and granite quarries; pop. (1920) 9952.

Westermarck, EDWARD ALEXANDER, Finnish anthropologist, was born at Helsingfors in 1862, and educated there at the university of Finland. Since 1890 he has lived in England, and in 1907 was appointed professor of sociology in the university of London. His works include *History of Human Marriage* (1891; 5th ed. rewritten in 3 vols. 1921; translated into principal European languages and into Japanese); *Origin and Development of the Moral Ideas* (2 vols. 1906–08; 2d ed. 1912–17); *Marriage Ceremonies in Morocco* (1914); *Ritual and Belief in Morocco* (2 vols. 1926); *Short History of Marriage* (1926).

Western Australia, the largest and emptiest state of the Australian Commonwealth, occupies the whole of the continent west of the 129th meridian—an area of 975,920 square miles—though its settled area lies almost wholly in the south-western corner. Apart from a strip of coastland that averages 60 miles in width, it consists of a huge and very ancient peneplain between 1000 and 2000 feet high, which extends across the South Australian border. On this are superimposed two higher areas, one near the middle of the State with no marked features to distinguish it, the other near its north-western edge, rising at Mount Bruce to over 4000 feet, and falling thence steeply to the coastland in two well-marked scarps known as the Hammersley and Barlee ranges. In the south-west three other scarps occur, the Smith, Darling, and Stirling ranges, but only the last rises above the 2000-feet level. The Kimberley district in the far north is diversified with a tangle of ranges running almost to the 3000-feet level and enclosing several extensive river-systems; the Fitzroy is 400 miles long, and the Ord about 300 miles, but neither is permanently navigable. The coastline in this quarter is rugged and beset with archipelagoes; south of latitude 18° it lacks variety, showing only two marked indentations between Broome and the South Australian border—the almost unused Exmouth Gulf, and the slightly more important Shark Bay. Most Western Australian ports stand on comparatively shallow bights, Broome on Roebuck Bay, Geraldton on Champion Bay, Bunbury on Geographe Bay, Esperance on Esperance Bay; of the two chief ports Fremantle faces Gage Roads—an open roadstead slightly protected by Rottnest Island—and Albany lies in the inner recesses of a good harbour (King George's Sound) surrounded by a belt of comparatively barren soil.

The rivers, too, south of lat. 18° are unimportant. Those of the north-west, from the Grey to the Murchison, are mainly flood-water channels, and those farther south are untraversable by heavy traffic above the reach of the tide. The greater part of the State is riverless and almost waterless; the inland river-beds sometimes delineated on maps are empty except when a thunderstorm occurs, and the lakes are no more than shallow saltpans. Four artesian basins, however, to some extent make up for this lack of surface water. The Eucla basin along the Great Bight, between the 123d and the 132d meridians, supplies stations on the trans-continental railway with brackish water, mostly sub-artesian. The Coastal basin borders the Indian Ocean from Geraldton southwards almost to Bunbury, and from 48 bores provides a large part of the water-supply of Perth and Fremantle. The North-west basin, extending along the coast from the Murchison to the Ashburton, is mainly utilised by private bores supplying sheep-runs. The Broome or Desert basin, between the De Grey River and King Sound, though nearly as large as the other three put together, is used only along its northern edge, where bores supply Broome and Derby. Its exact boundaries are uncertain, but officially it is supposed to cover at least 115,000 square miles of the area mentioned above. A small basin belonging properly to the Northern Territory supplies Wyndham in the far north from its western extremity.

The south-western corner, often known as 'Swanland,' deserves separate mention. About 80,000 square miles in area (less than a twelfth of the whole State), its exposure to the full force of the Southern Ocean's westerlies assures it a minimum annual rainfall of 15 inches, increasing on the southern edge of the coastal ranges to 42 inches. This ample supply concentrates in Swan-land 86 per cent. of the State's population and the mass of its agriculture and industries (for details, see *Industries* and *Population*, below); and the timber resources of the Bunbury-Leeuwin corner and the belt of wheatfields and orchards that stretches from Northam south-east towards Albany provide the soundest (possibly the only sound) bases for the active immigration policy on which the State has embarked. There is nothing like it throughout the rest of the huge Western Australian area.

The geology of the State is comparatively simple. The substructure everywhere is of pre-Cambrian granites, gneisses, and schists, overlain in the Kimberley area with Cambrian limestones and marine Devonian rocks, and along the rest of the coastline with Permo-Carboniferous sandstones, limestones, and shales, which near Perth include coal-deposits. Jurassic deposits occur near Geraldton, Cretaceous rocks at intervals all round the coast, and the Bight is bordered with Miocene limestones that form the 400-mile stretch of the Nullarbor Plains. Inland the granite peneplain lies exposed; embedded in it, running north and south, usually within intrusive inliers of gneiss, are the great auriferous belts that have made the State famous. The most westerly carries the Southern Cross and Yalgoo fields; the next includes Coolgardie, Mount Magnet, and Cue; a third accounts for the extreme richness of Kalgoorlie, but becomes poorer at Sandstone and Meekatharra; the last extends from Kanowna through Menzies, Leonora, and Wiluna, and reappears in the north at Nullagine and Marble Bar. In this northern extension there occur important deposits of tantalite associated with tinstone, and small quantities of the radio-active uranium-lead ore pilbarite.

History.—Geographers of hardy imagination have asserted that the coast of Western Australia was discovered by Portuguese or French navigators during the early part of the 16th century. The first certain landfall, however, on that part of the continent was made by Dirck Hartog in the ship *Eendracht* on 25th October 1616 at Shark Bay; on the northern point of the island that encloses the

WESTERN AUSTRALIA
English Miles
0 50 100 150 200 250 300 350 400
Kilometres
0 50 100 200 300 400 500 600
TIMOR SEA
INDIAN OCEAN
GREAT AUSTRALLIN BIGHT
KIMBERLEY DIVISION
NORTH AUSTRALIA
CENTRAL AUSTRALIA
SOUTH AUSTRALIA
Great Sandy Desert
Gibson's Desert
The Great Victoria Desert
Tropic of Capricorn
Dampier Land
Table-land
NORTH WEST DIVISION
EASTERN DIVISION
CENTRAL DIVISION
SOUTH WEST DIVISION
EUCLA DIVISION
Dampier Archipelago
Barrow I.
Ashburton Goldfield
Gascoyne Goldfd
Peak Hill Goldfd
Murchison Goldfield
East Murchison Goldfield
Mt Margaret Goldfield
Yalgoo Goldfield
Coolgardie Goldfield
North Coolgardie Goldfield
East Coolgardie Goldfield
Dundas Goldfield
Yilgarn Goldfield
Northam
York
Beverley
Bruce Rock
Narembeen
Premier Downs
Table-land
Escape Well
Native Well
Native Wells
Family Well
Separation Well
Patience Well
Dry Native Well
Native Well
Native Well

bay he set up a post with a tin plate recording his visit. He was on his way from Holland to Java, and had been blown out of his intended course. His report induced the Dutch government to issue fresh orders to Java-bound ships; henceforth for about 4000 miles of their eastward voyage, after passing the Cape of Good Hope, they must take advantage of the prevalent westerlies that blow south of latitude 40°, and only then strike north for their destination. The immediate result was that many of these vessels sighted the western coast of Australia, and several took occasion to explore it —notably the *Gulden Zeepaert* in 1627, which coasted the Bight for 1000 miles and left the name of a passenger, Pieter Nuyts, on the map of her discoveries. Old maps of Australia, indeed, decorated the Western Australian coast with many Dutch names, but only one has lasted—that of Cape Leeuwin, sighted in 1622 by the vessel of that name. In 1622 also the Dutch authorities organised an expedition to explore and annex the whole coast, even if it should extend to 50° S. latitude, but, luckily for the British Empire, this expedition never set out. Among the many navigators who during this century visited some part of the western coast the most noteworthy are Francis Pelsart, whose voyage ended in shipwreck and mutiny; Abel Tasman, who sketchily surveyed the northern and north-western coasts as far as Exmouth Gulf; and Willem de Vlamingh, who in 1696 investigated the Swan River and visited Shark Bay, finding there—and removing to Batavia, whence it was sent to the States Museum at Amsterdam—Dirck Hartog's tin plate. A few years earlier (in 1688) William Dampier had landed in King Sound, and in 1699 he returned in a king's ship, the *Roebuck*, to explore the new country more thoroughly. But neither Dampier nor any of the Dutchmen thought the land worth having; and the net result of a century of coastal voyaging was an outline on maps and a widespread disgust with the unpromising neighbourhood.

Towards the end of the 18th century, however, French navigators began to busy themselves about Australia, and in 1772, and again in 1792, their vessels coasted the south-western shores. In 1791 George Vancouver, on his way to western America, discovered King George's Sound; in 1801 Matthew Flinders surveyed the coast from Cape Leeuwin eastwards, and Nicholas Baudin surveyed the stretch from Shark Bay to King Sound, while his comrade Hamelin investigated the Swan River and Shark Bay. These rival explorations account for the mixture of English and French names along these shores; Flinders and Phillip King, whose later surveys established the nomenclature still current, were scrupulously careful to retain everywhere names given by the original discoverer, whatever his nation. Baudin in 1803 completed his surveys of the western coast; and, when after 1815 European nations were again free to think about distant oceans, Freycinet in 1818 revisited Shark Bay, and Dumont d'Urville in 1826 was busy in King George's Sound.

This French curiosity about Australian territory gave the British government seriously to think. The Freycinet voyage made them send Phillip Parker King in 1817–1822 to complete Flinders's surveys of the western coast, and in 1826 d'Urville's departure for the East led them to discuss with Governor Darling the respective merits of Shark Bay and King George's Sound. Darling, while pooh-poohing both harbours, at once sent off Major Lockyer with a military expedition to occupy the Sound, and on Christmas Day of 1826 the British flag was hoisted there. For the first time the whole continent was conceived as being British, and Lockyer was instructed to warn any Frenchmen he might encounter that their stay on Australian territory would be 'an unjustifiable intrusion on His Britannic Majesty's possession.' This settlement was not successful; the soil was barren, the settlers were often half-starved, and only sealers and whalers reaped any benefit. Not from that centre was a colony to be constructed.

Meanwhile Captain James Stirling, sent out to plant a settlement in northern Australia, had visited and become enthusiastic about the Swan River region. In 1827 he failed to persuade the British authorities to use it for a military post which should 'command India and the Malay Islands'; but a renewed application in 1828 induced a new Ministry to send out Fremantle in the *Challenger*, and on 2d May 1829 the flag was hoisted at Swan River. Stirling, appointed lieutenant-governor at the end of 1828, reached his command in June 1829, and in August founded Perth. The settlement was the first established on a definite semi-philosophical plan. A syndicate headed by Thomas Peel (a relative of Sir Robert) had offered to settle 10,000 people on the land if four million acres of it were allotted to them. The government, playing for safety, refused to countenance this gigantic speculation, but announced that parties of which about half must be females would be granted forty acres for every £3 they might 'invest upon public or private objects in the colony to the satisfaction of his Majesty's government,' passage-money to the amount of £15 being accepted as such an investment. The syndicate thereupon dissolved, but Peel offered to populate a million acres on those terms; he did his best, found himself incapable of managing so great an enterprise, and died a disappointed man. Many of the smaller settlers also came near to ruin, often because they had misinterpreted the government's offer, and based their claims to land on the intrinsic value of imported articles which were of no value at all as 'investments' for aids to settlement. The essential error, however, of the settlement scheme was that the quality of the land was not taken into consideration. Farm-lands along the Swan were granted away in blocks of from 2000 to 15,000 acres, whereas the forest country farther inland was doled out in 100-acre blocks. A few very large grants — Peel's of 250,000 acres, Stirling's and Lautour's of 100,000 each—were located at some distance from the main settlements. Within six years the upper Swan was being exploited, a second centre of settlement had been established at Bunbury, and the station at Albany on King George's Sound had been absorbed. But progress was very slow, immigration ceased entirely, and, in 1839 there were only 2150 people in the colony. In 1846 its state was desperate, partly because the authorities in London insisted on applying to it the regulation—barely justifiable for the eastern colonies—whereby Crown lands must not be sold under £1 an acre; intending Australian settlers naturally preferred to buy at that price land in New South Wales or Victoria. In 1847, however, deposits of coal and zinc were found, and the sandalwood trade began to flourish; nevertheless labour was lacking, and after experiments with Chinese the colony made up its mind to ask for convicts. In 1849 a petition to that effect was forwarded to London; in November the necessary proclamation was formally made; in June 1850 the first batch of convicts arrived, along with an equal number of free assisted immigrants. With this access of labour public works were initiated on a large scale, and thenceforth progress was steady. The population increased from 6000 (1850) to 25,000 (1870), the revenue from £20,000 to nearly £100,000, the farmed land from 7500 acres to 54,500.

At the best, however, settlement affected an

insignificant patch of an enormous region, and efforts were repeatedly made during the early years to add by exploration to the cultivable area. George Grey in 1837–40 investigated the coastlands of Brunswick Bay and Shark Bay; E. J. Eyre in 1841 made his way along the Great Bight from Fowler's Bay to Albany; in 1845–48 the brothers Gregory explored the river-valleys north of Perth as far as the Gascoyne; Roe in 1848–49 opened up timber-lands to the south-east, and Austin in 1854 pastoral land to the north-east, of the settled areas; A. C. Gregory in 1855–56 traversed a dry region in the far north; and his brother in 1857–58 mapped the Gascoyne district, and in 1861 thoroughly explored and opened up the north-west, from the De Grey River to the Ashburton, adding to the colony over two million acres of excellent pasture-land, and initiating the Western Australian pearl-fisheries. This extension of the pastoral area (evidenced in the increase of cattle from 13,000 in 1850 to 45,000 in 1870, and of sheep from 128,000 to 609,000) so improved the position of the colony that little disturbance was caused when in 1868—chiefly at the requests of the eastern colonies—transportation was brought to an end. In the next few years representative government was conceded, several railways were built, and explorations by John and Alexander Forrest, Giles, and Warburton ascertained the true nature of the immense inland wastes. Alexander Forrest's journey of 1879 through the Kimberley district added twenty-five million acres of good pasture-land to the colony's utilisable area, but the other results were on the whole disheartening.

Ever since 1852 discoveries of gold had been reported from various outlying stations, but the first 'rush' was in 1884–86 to Kimberley. This field proved disappointing; it had, however, attracted experienced diggers to the west, and from 1887 onwards an astonishing number of rich fields were opened up in the waste lands east of Perth—Southern Cross (1887), Pilbara (1888), Nannine (1891), Coolgardie (1892), and Kalgoorlie (1893). For the next thirty years the yield from these and other fields averaged almost £5,000,000 annually, the acme being reached with the 1903 yield of £8,771,000. The effect on the colony's prosperity may be judged from the following figures:

	Population.	Revenue. £.	Area under Crop. Acres.	Railways open. Miles.	Commerce. £.
1887..	42,488	377,904	66,163	168	1,091,810
1900..	179,708	2,875,396	201,338	1,355	12,814,232

In 1890 Western Australia became self-governing, and established an Australian 'record' by retaining in office a single premier—John Forrest—for ten years without a break. He justified the choice by giving the colony liberal land legislation, a well-thought-out railway system, and much-needed harbour works at Fremantle (before their construction all big ships were forced to call at Albany); he also gave the goldfields a water-supply, brought 300 miles across country through eight pumping-stations from Mundaring near Perth. The campaign for federation in the nineties showed the existence of two marked parties in the colony—the older settler-families of the Perth-Albany region, bound by many ties directly to Britain, and not enamoured of closer union with the eastern colonies, and the more recent immigrants from those colonies who formed the bulk of the goldfields population. In 1899 the goldfields even petitioned for separation from the coastal settlements in order to form a new colony which would at once join the proposed Commonwealth. Forrest vainly attempted to secure from his fellow-premiers special terms for his colony, but was forced by the goldfields to enter the Commonwealth without any concession except the right for five years to levy customs duties on goods coming from the other States. The coastal section, however, has never heartily accepted federation, and has on several occasions threatened to ask for separation; as the goldfields population has of late years diminished considerably, the recalcitrants have gained in strength. To meet some of the more practical grievances the Commonwealth grants Western Australia a special annual subsidy over and above the *per capita* grant which all states receive. Further, the isolation of the State from its fellows—which formerly made it almost as separate a community as New Zealand—has been diminished by the construction of a trans-continental railway between Kalgoorlie and Port Augusta in South Australia.

Industries.—Apart from its goldfields, which have already been discussed, Western Australia's chief industry is wheat-growing, carried on mainly in a strip parallel to the coast (but not on it) stretching from Geraldton south to Katanning near Albany. The industry is of quite recent origin; in 1900 only 200,000 acres were under crop, in 1911 less than a million, in 1925 nearly three million—about 70 per cent. of this was under wheat. Even in 1920 the State yielded barely 8 per cent. of the Australian crop, whereas in 1925 it yielded nearly 18 per cent. In 1926–27 2½ million acres under wheat yielded 30 million bushels. The timber industry is notable. From less than one-eighth of the Commonwealth's forested area Western Australia produces almost a third of its timber; for in this state alone exist forests of the valuable jarrah (*Eucalyptus marginata*) and karri (*E. diversicolor*) hardwoods, and the Australian exports of sandalwood (to China) and tan-bark (to Germany) come also mainly from Western Australia. Cattle thrive in the north, along the Ord and Fitzroy rivers, and are brought south to market along defined stock-routes, on which the government maintains wells. Sheep are grazed all over the south-western region, and are the chief occupants of the north-west between the Fortescue and the Gascoyne. In both cases the State contains only 7 per cent. of the Australian total; but at the end of 1926 it held 7½ million sheep, and its wool production was 50 million pounds. The south-western corner also produces good crops of oats, orchard-fruit, and table-grapes. In minerals Western Australia still accounts for about two-thirds of the Commonwealth's gold yield; the rest of its mineral yield is insignificant, but includes about half a million tons of coal (from the only field west of Gippsland in Victoria), and a little tin (from Greenbushes in the south-west), silver-lead (from Northampton near Geraldton), and copper. At Yampi Sound, close to King Sound, huge deposits of iron-ore are known, but have not yet been exploited; official estimates of them reach nearly 100 million tons. The Western Australian pearl-fisheries have been in operation since 1861, and have produced the finest pearl found in Australian waters, valued at £14,000; of recent years their average annual product has been about £50,000 worth of pearls and about 1400 tons of shell.

Population, &c.—On the 31st of March, 1926, the State's population was estimated at 372,732, 48 per cent. of whom live within the metropolitan boundaries. The remainder is distributed remarkably. About 130,000 live in the south-western corner, between Perth and Albany; perhaps 10,000 between Perth and Geraldton; the goldfields may account for 25,000 more; in the other four-fifths of the state the rest are scattered, mostly in small seaports, averaging 1 person to every 30 square miles of country. About 12,000 aborigines inhabit districts within white influence, and it is estimated that about 10,000 more live

outside those districts. Excluding aboriginals, less than 2 per cent. of the population is non-European; this comparatively large proportion is accounted for by the employment of Asiatics in the pearl-fisheries.

The State government is of the usual Australian type, with a governor appointed by the Crown, two legislative chambers—a council of 30 members elected from 10 provinces, a third retiring every second year; an assembly of 50 members elected for three years under a preferential system—and a ministry of 6 administering 15 departments, and assisted by several colleagues without portfolios. In the Federal Parliament the State has 6 senators and 5 representatives. The public revenue for 1924–25 was £9,381,000, the expenditure £8,440,000, and the public debt on 30th June 1925, £64,493,261. Of the money borrowed more than a quarter was used in making advances to settlers or purchasing land for settlement, about 36 per cent. on railway or tramway construction, and about 12 per cent. on water-supply works. Over 40 per cent. of the revenue and about 40 per cent. of the expenditure is connected with the State railways, which are the least burdensome in Australia, paying 1 per cent. net on their capital cost. They comprise 3732 miles of track of 3 ft. 6 in. gauge; in addition, the Commonwealth's transcontinental line has 454 miles of 4 ft. 8½ in. gauge, and private companies own 854 miles more, mostly of the normal state gauge. For local government purposes the State is divided into 21 municipalities and 123 road-board districts. Water-supply, which is wholly under government control, includes (*a*) the supply of Perth and 14 country towns; (*b*) the goldfields supply; (*c*) the sinking and maintenance of tanks and wells along stock-routes. Primary education is compulsory between the ages of 6 and 14. Over 900 schools, 87 per cent. of which belong to the state, provide education for about 67,000 scholars; in state schools no fees are charged. Secondary education is given by the state in seven high schools, and a number of classes attached to the other schools; a school of agriculture and practical instruction on the state experimental farm provide training for young farmers. Teachers are interchanged with the London County Council. The University of Western Australia, opened at Perth in 1913, has a staff of 7 professors and 27 lecturers; in 1924 there were 372 matriculated students.

In 1925–26 the oversea trade of Western Australia —which passes for the most part through Fremantle —was valued at nearly £21,000,000, of which over 12½ millions were accounted for by exports; of these the principal were wool (3½ millions), timber (1½), wheat and flour (5½), and gold (1).

BIBLIOGRAPHY.—See AUSTRALIA, and books there cited, also PERTH, and articles in *The Australian Encyclopædia* (1925–26) on Exploration (French), Exploration by Land, Exploration by Sea, Geography, Geology, Perth, Water Supply, and Western Australia. For the period of discovery, G. A. Wood's *Discovery of Australia* (1922) is the standard history; and for the development of the State up to 1900, J. S. Battye's *Western Australia* (1924).

Westfield, a town of Massachusetts, 9 miles by rail W. of Springfield, with manufactures of paper, hardware, machinery, tobacco, &c.; pop. (1920) 18,604.

Westgate-on-Sea, a seaside resort 1½ mile west of Margate; pop. 5000.

West Ham. See HAM (WEST).

Westhoughton, a town of Lancashire, 5 miles E. of Wigan, with manufactures of silk, cotton, and nails; pop. (1921) 15,593.

West India Regiment, was disbanded in 1926. See COLONIAL CORPS.

West Indies, the great archipelago which extends in a vast curve from Florida in North America to the north coast of South America, separating the Atlantic Ocean from the enclosed waters of the Mexican Gulf and the Caribbean Sea. The name still bears testimony to the belief cherished by Columbus that when he reached in the Bahamas the outlying portion of the New World he was actually on or close to that old-world India which it was his design and hope to arrive at by sailing constantly westwards (see BAHAMAS, COLUMBUS). The name Antilles (q.v.) which is applied to the whole of the islands save the Bahamas, retains a trace of the belief in the old submerged continent of Antiglia. The islands include five larger islands and several more or less well-defined groups—Cuba, Jamaica, Hayti, Porto Rico, Trinidad, the Bahamas, the Virgin Islands, the Caribbee Islands, or Antilles proper, divided into Leeward and Windward. A list of these islands, showing their area, population, and political connection (independent, or belonging to Great Britain, the United States, France, or Holland), is given at AMERICA (p. 225). The possibilities of a British West Indian federation have been variously discussed.

The fauna of these islands, which is Neotropical (see GEOGRAPHICAL DISTRIBUTION), and the geological structure make it probable that in Pleistocene times the islands formed a *terra firma* connecting North and South America. Calcareous rocks predominate on the whole, in some cases overlying granite and other igneous rocks; some of the minor Antilles are wholly volcanic; coral-reefs are found on many of them. The Bahamas are especially low-lying. All the islands except the northern Bahamas are tropical—the extreme limits being 10° and 27° N. lat.—and the climate corresponds to the geographical position, a fair degree of coolness being found at considerable elevations on the higher islands. The year is divided into wet and dry seasons, the principal rainfall being in October, and the longest dry season being from December till April. The islands are liable to severe hurricanes. The luxuriant and varied flora and the productions are best described in the articles on the several islands and groups.

Among great events in the history of the islands as a whole are the discovery (1492); the Spanish occupation; the introduction of negro slaves (1525) to take the place of the native Carib Indians, decimated by forced labour on the plantations; the development of the sugar industry; the gradual intrusion in the 17th century of French, English, and Dutch. Between 1635 and 1719 France secured Guadeloupe, Martinique, Grenada, and St Vincent; in 1632 Tobago and Curaçao became Dutch; in 1623–1763 England obtained possession of St Christopher, Barbadoes, Antigua, Dominica, and the Grenadines. England's growing power at sea forced France to cede St Lucia, Grenada, and St Vincent; the defeat of the French fleet by Rodney off Dominica in 1782 was one of the great naval battles of the world's history. Trinidad was long a bone of contention between France and England; Hayti (q.v.) has had a peculiarly chequered history; in 1898 Spain relinquished Cuba and ceded Porto Rico to the United States; and in 1916–17, Denmark sold to the United States her part of the Virgin Islands (q.v.). The West Indies were long haunted by the Buccaneers (q.v.), and some of them were used by Britain as penal settlements. The abolition of slavery in the English islands (1834–38) was regarded by the planters as the cause of a great decline in prosperity—complicated later by the sugar bounties.

See the separate articles on the greater islands and all the groups, with the books there cited. See also books on the West Indies by Eden (1880), Eves (4th ed. 1897), Stark (1898), Aspinall (1912), Ormsby Gore (1922), Wrong (1923); Froude, *The English in the West Indies* (1888); Rodway, *West Indies and the Spanish Main* (1896): Root, *British West Indies and the Sugar Industry* (1899); Walker, *West Indies and the Empire* (1901); Lucas, *Historical Geography* (rev. ed. 1905); Bradley, *Historical Account* (1911); Joyce, *Central American and West Indian Archæology* (1916).

Westinghouse, GEORGE (1846–1914) American inventor, was born at Central Bridge, N. Y., joined the Union army in the civil war, and entered Union College, Schenectady. He invented numerous railway appliances, patenting the famous Westinghouse air-brake in 1869 (for description with diagram, see BRAKES), and later turned his attention to exploitation of the alternating current for power and lighting. His huge machine-shops at Pittsburgh also produced generators for the power-plants at Niagara Falls, &c., as well as steam turbines and other machinery. See Lives by Leupp (1919) and Prout (1922).

Westland, a provincial district of New Zealand, was formerly part of Canterbury, and occupies the western portion of South Island. The chief town is Hokitika. Area 4881 sq. m.; pop. (1926) 15,025.

West Lothian. See LINLITHGOWSHIRE.

Westmacott, SIR RICHARD, R.A., an eminent sculptor, the son of Richard Westmacott, also a sculptor, was born in London in 1775. In 1793 he went to Rome to complete his studies, where he became in some sort a pupil of the celebrated Canova. His progress was rapid, and he carried off the highest prizes, in particular a gold medal given by the pope. In 1797 he returned to London, where his success in his art was not for a moment doubtful. In 1805 he was elected an A.R.A., in 1816 R.A.; and in 1835 the university of Oxford conferred upon him the honorary degree of D.C.L. Two years afterwards the honour of knighthood was bestowed on him. In 1827 he succeeded Flaxman as professor of Sculpture at the Academy. He died September 1, 1856. The works by which he is chiefly known are public monumental statues, in some of which he had much success. Of these it may suffice to mention his monuments in Westminster Abbey to Pitt, Fox, Perceval, and Addison, and in St Paul's to Sir Ralph Abercromby and Lord Collingwood. Many of his works in the antique classical manner are also of exquisite beauty and finish.—RICHARD WESTMACOTT, R.A., son of the foregoing, was born in London in 1799. He passed six years in Italy (1820–26), and after his return to London he gradually won a reputation for himself as one of the ablest sculptors of the day. He was elected F.R.S. in 1837, became A.R.A. in 1838, and R.A. in 1849. He succeeded his father in the professorship of Sculpture in 1859, a post which he filled with distinguished ability and acceptance. He died April 19, 1872. He contributed to various encyclopædias, and wrote a pamphlet on *Colouring Statues*, and a *Handbook of Sculpture* (1864).

Westmeath, an inland county of Leinster, Ireland, between Meath and Roscommon; greatest length NE. and SW., 45 miles; greatest breadth, 25 miles; area, 434,665 acres. The surface is for the most part level, the hilly district in the north not reaching a higher elevation than 710 feet. Geologically, Westmeath belongs to the great central limestone series. Of the numerous lakes which diversify the surface one chain belongs to the basin of the Shannon, which river, with its lakes, forms the western boundary; the other, towards the east, belongs to the basin of the Boyne. The Royal Canal traverses the county. The climate is mild and not very moist. The soil is a deep loam, producing herbage especially suited to the fattening of cattle, which are largely fed. There is little tillage, and almost the only cereal crop is oats. The chief towns are the assize town and capital, Mullingar, and Athlone, formerly partly in Roscommon. Westmeath anciently formed a portion of the kingdom of Meath (q.v.), but in the reign of Henry VIII. it was erected into a separate county, and at first included Longford (q.v.) and part of the King's County (q.v.). Many antiquities of the Anglo-Norman period, and some of the Celtic, chiefly tumuli and raths, are found in this interesting and picturesque county. Pop. (1841) 141,578; (1881) 71,798; (1926) 56,796.

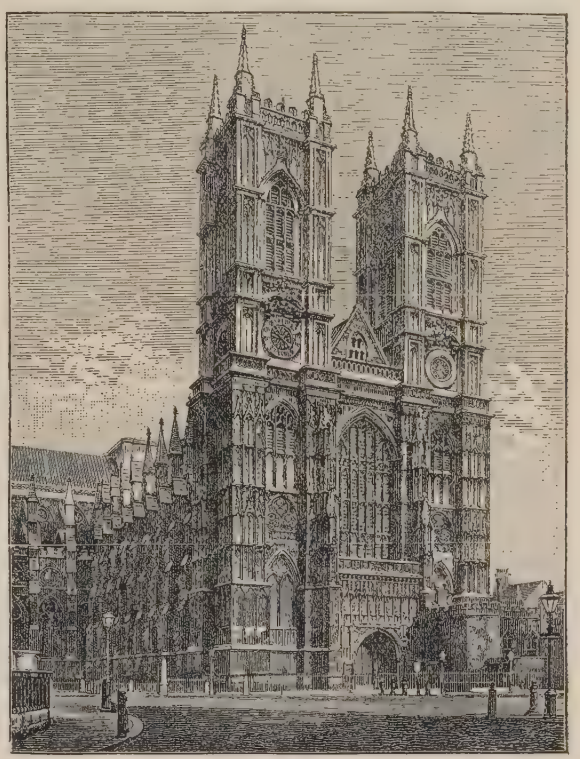
Westminster, since 1900 a city as well as one of the metropolitan boroughs of London, is named from its great church built on what was once an island in the Thames, referred to in old records as 'Thorney.' It stands opposite the spot at which the Watling Street from Chester met the Watling Street from Dover, the two ends being connected by a ford. On the Surrey side was a pavement—Stangate—and on the Middlesex side a low hillock—Tothill, which denotes, probably, a height (O.E. *totian*, 'to project') used for a look-out or a beacon. On the building of London Bridge by the Romans traffic through Westminster ceased, and the Watling Street was diverted at what we call the Marble Arch. That Westminster was of early importance (possibly it is of earlier importance than London) is attested by the discovery of a mosaic pavement near the west end of the Abbey Church. Its position, at the point where the Watling Street emerged from the great Middlesex forest, and where, owing to the great width of the Thames, fording was safe and easy in fine weather, can be made out even on a modern map, where all contours have been so greatly altered by the embankment of watercourses, the levelling of roadways, and the building of houses. The land round the site of the future abbey was covered at every tide. A great estuary appeared at St James's Park, another opposite at Battersea; and at low-water, unless the volume of the Thames was much greater than it is now, the crossing between Thorney and Stangate must have presented little difficulty. But of records on the subject we have none. The now chiefly obliterated geographical features and the chiefly obsolete local names are our only guides. Westminster was, by the London Government Act of 1899, made one of the municipal boroughs of which the reorganised county of London was composed, and in 1900 was made a city (as of old) by royal charter. The ten vestries of which it was formerly composed were abolished, and it is now governed by a mayor, ten aldermen, and sixty councillors. It comprises two parliamentary divisions, each of which returns one member to the House of Commons—viz. the Abbey, and St George's Hanover Square. The population in 1891 was 201,969, and in 1921 it was 141,317; and the rateable value was in 1921 over 8 million pounds. The name contains a reference to an ancient abbey church, probably founded about the time of Offa, but refounded by Dunstan in the time of King Edgar, and supplied with regular monks. The exact date cannot now be ascertained, owing to a falsification of the only known copy of Edgar's charter, but it must have been about the year 971. The name further contains a reference to another minster, that of St Paul, which, it may be inferred, was older. Edward the Confessor lived chiefly at Westminster, and some of the buildings he provided for the monks may still be seen. He also rebuilt the church, and of his work an archway in the south transept may be identified. Of his palace no trace is left, but it

stood, presumably, east of the abbey. The church was consecrated in 1065, and Freeman, the historian, was of opinion that the ill-fated Harold was crowned in it. The Conqueror was certainly crowned there, and in 1163 Edward the Confessor was canonised. In 1269 a new church, that which we now see, was consecrated, having been built by Henry III. in honour of the royal saint. The church was carried on by successive kings, and, in fact, was not completed till 1735, when the western towers were built, but the nave was finished under Richard II. The chapel of the Annunciation, or chantry of Henry V., was built in the reign of Henry VI. The Lady Chapel, or chapel of Henry VII., an elaborate example of the last phase of the old Gothic style, was completed by Henry VIII., who afterwards suppressed the monastery and made Westminster a bishopric, which, however, lasted for ten years only. James I. set up the last of the royal monuments, those, namely, to his mother, Mary of Scotland, and to his predecessor Elizabeth. The north front was rebuilt by Wren, and was a beautiful example of his taste in Gothic. It was pulled down, and a new and less appropriate design by J. L. Pearson substituted in 1890. The church is the burial-place of thirteen kings of England, including Henry III., Edward I., Edward III., Richard II., Henry V., Henry VII., Edward VI., James I., Charles II., William III., and George II., as well as of five queens in their own right, and the queens of many of the kings. In the reign of Richard II. the practice of burying court favourites and others in the abbey commenced, and the first poet to be laid in the south transept, often called the Poets' Corner, was Geoffrey Chaucer, who probably owed this distinction as much to the fact that he was clerk of the works in the abbey, and occupied a house on the site of the chapel of Henry VII., as to his poetry. In the same transept are buried Spenser, Dryden, Garrick, Johnson, Dickens, Browning, Tennyson, and others of less note; and many monuments commemorate poets and literary men buried elsewhere. The first Lord Lytton was buried in the chapel of St Edmund. Handel's grave is in the south transept, Dean Stanley's in the chapel of Henry VII. The north transept contains the graves of Mansfield, the two Pitts, the three Cannings, and other statesmen. In the nave are buried Newton, G. Scott, Street, Livingstone, Ben Jonson, Sir Charles Barry, Robert Stephenson, and Charles Darwin. Here, too, is the grave of the British 'Unknown Warrior.' Nearly all English kings and queens have been crowned here, and since Edward I.'s reign have used the chair holding under its seat the Stone of Scone (see CORONATION).

The abbey did not produce any remarkable literary men. The mediæval chronicle, *Flores Historiarum*, was originally attributed to one Matthew (q.v.) of Westminster, but this name has been proved fictitious. The last lord abbot, called Boston, as Benson became the first dean. The chapter includes six canons, one of whom is archdeacon.

Shortly before the dissolution of the monasteries William Caxton, having acquired the new art at Bruges, had set up the first English printing-press, in the Almonry, a little to the west of the western front of the abbey and within its precincts. He continued to print books here until his death in 1491. He is commemorated by a monument in the church of St Margaret, where he is buried.

The abbey remains are numerous, some of them being in the occupation of the school; but all the gates, among them the abbot's prison, in which Raleigh spent his last hours, have disappeared, except part of the gate into College Street from Dean's Yard. The cloisters, except for restorations, are unusually perfect, and the domestic buildings, of the Confessor's period and therefore unique in England, are extensive, and would be more so but for the past vandalisms of those in authority. It is a singular fact that the best preserved of the domestic buildings of Westminster Abbey are those of which the school has the custody, the fatal injuries to Ashburnham House and to the Dark Cloister having been inflicted by the dean and chapter. The Abbot of Westminster was a peer of parliament, took precedence of all other English abbots, and had a great income. He enjoyed many privileges in common with the Benedictine monks over whom he ruled, and had the custody of many of the crown jewels, and of the whole regalia at the time of a coronation. The dean has succeeded to some of the privileges and more of the duties, and the heaviest part of such ceremonies as the jubilee of Queen Victoria or the coronation of King George V. falls upon him. Abbot Boston or Benson surrendered his house to Thurlby, who for ten years was the first and last Bishop of Westminster. A few years later the dean obtained the old house, all but the hall, which had been given to the school; and the lord of the manor of the church of St Peter resides in his manor-house in the reign of King George as he resided in the reign of Queen Elizabeth. While nothing remains to Westminster of the original 'terra Sancti Petri' except St Margaret's and St John's, an outlying corner, probably representing the manor of Neyt, and now known, but only since the reign of William III.,



Westminster Abbey.

as Kensington Gardens (see KENSINGTON), is still mainly in the metropolitan borough of Westminster. The palace of Kensington is beyond the boundary. Manorial rights are rather shadowy; but a complete account of the manor of Westminster, with reference to the points where, in the course of ages, it came into contact with municipal life, would be interesting. The Dean of Westminster is still, at least nominally, lord of the manor, and appoints a steward, who is generally some nobleman of high rank. There are also a bailiff and sixteen burgesses. The deanery contains the 'chamber called Jerusalem,' probably from a view of the holy city among its original decorations, approached by the 'chamber called Antioch,' for a similar reason. Jerusalem forms a chapter-house, the original chapter-house in the east cloister having for centuries been used by the House of Commons, and afterwards for the storage of state papers. It is now crown property, and having become ruinous it was almost rebuilt by Sir Gilbert Scott, but contains still some part of its ancient decorations. The school closely adjoins the abbey, and the great school-room is part of the monk's dormitory, an interesting room, much disguised by restorers, but apparently containing remains of the Confessor's buildings. Close to it is a beautiful chamber in the style of Inigo Jones, or Webb. It is known as Busby's Parlour. Farther to the south, and looking into the College Garden—the 'college' here refers to the dean and chapter, not the school—is Lord Burlington's exquisite school dormitory; the interior was never finished, and is very plain. But the most interesting of the post-Reformation buildings belonging to the school is Ashburnham House, which was built either by Inigo Jones or by Webb from his designs. It was much spoilt by the canons who held it as a residence, but the staircase, of complicated design, and two rooms above are in a very superior style. The house stands on part of the site of the abbey 'misericorde,' and has remains of a buttery hatch in the hall. The deposed abbot lived here as dean, while the bishop occupied the abbot's old house, now the deanery. Some eminent men have been masters of the school, which was founded as St Peter's College by Queen Elizabeth in 1560, among them being Camden, the Elizabethan antiquary, Busby, and Vincent Bourne; and among the scholars have been George Herbert, Cowley, Dryden, Prior, Cowper, and Southey, among poets; Wren stands alone among artists; but the list of statesmen includes Warren Hastings, Lord Mansfield, and Lord Russell; Gibbon and Locke represent history and metaphysics. In Dean's Yard is the Church House.

The churches of Westminster are now very numerous, but the original parish churches are only St Margaret's and St John's. St Margaret's seems to have first been built a few years before 1140. The people had previously worshipped in the abbey church, and in Domesday the whole of the abbot's manor, which extended then to the walls of London, is designated as 'St Peter's.' St Margaret's has never been remarkable for its architectural features, but as we see it now is in a poor style of Gothic, with many modern additions, such as a porch and new window tracery. The famous Scrope and Grosvenor controversy, when Chaucer gave evidence, in 1386, was held in St Margaret's Church. The headless body of Sir Walter Raleigh was buried in it in 1618. The east window is old Dutch. The church is supposed to be the special charge of the House of Commons. The boundary line between the parishes of St Margaret and St John passes between the two Houses of Parliament, the Lords being in St John's, the church of which was consecrated in 1728. Near here are the renovated building of the Middlesex Guildhall, and the modern Wesleyan Central Hall. The Houses of Parliament, old Whitehall, St James's and Buckingham palaces—all the royal palaces of London except that at Kensington—are in the city of Westminster. In front of Buckingham Palace is the grandiose Queen Victoria Memorial (1911). From there a new processional road along the Mall leads under the imposing Admiralty Arch to Trafalgar Square, where are the National Gallery and the National Portrait Gallery. Most of the government offices also are in this district; and near Westminster Bridge is New Scotland Yard, the headquarters of the Metropolitan Police. Of Whitehall Palace but little remains. The chief relic was till 1891 the Chapel Royal, Whitehall. Henry VIII. first made a palace here. In 1512 he was burnt out at Westminster, and having seized Wolsey's house at Charing Cross, he made an arbitrary series of regulations calculated to cut the inhabitants whose houses were north of a line drawn through the middle of the Royal Horse Guards off from their parish church. Being annoyed at funerals passing from one end of the divided parish to the other, he eventually built St Martin's. In 1536 he persuaded his subservient parliament to pronounce the old palace to be only 'a member or parcel' of the new palace at Whitehall. He dwelt much here, and added both to the buildings and the gardens. Holbein is said to have constructed the gate, the stones and terra-cotta of which were subsequently transferred to the Long Walk, Windsor Park, where they slumber in peace under a thick layer of turf, having never been set up again. (Views and plans are to be seen in J. T. Smith's *Westminster*.) James I. constantly used Whitehall, and set Inigo Jones to design him a great palace on the site. By this design the palace was to stand on both sides of the road to Westminster. Nothing was ever built except the chapel, as it was afterwards called, then a banqueting hall. Inigo made a second design for Charles I., in which the palace was to be only half the size, and was not to cross the road. Nothing was ever done, but it is necessary to mention both designs, as most writers mix them up. On the street front of this banqueting hall are some blank windows. One of these, the fourth from the north end, was broken through to provide an exit from the ground-floor of the hall to a ladder outside, leading to the scaffold, and by this passage Charles I. went to his doom. The broken wall was identified in later times behind the facing stones (see Jesse, *Court of England*, 1840, vol. i. p. 466). There is much about Whitehall in the diaries of Pepys and Evelyn. The old parts of the palace were burnt in 1697, and never rebuilt, but it is said that a hall of Wolsey's is actually enclosed in the buildings of the Treasury, having been continually altered but never pulled down. The beautiful Chapel Royal was closed in 1891, and in 1893 the building became the Royal United Service Museum. Not far off rises the plain but striking Cenotaph, as a national World War memorial to 'The Glorious Dead.' Close to St James's Park is Lancaster House (formerly Stafford House), where the London Museum was moved to (1914) after being instituted at Kensington Palace in 1912.

The present 'palace of parliament' stands on a site associated with nearly six centuries of representative institutions. It may have been originally selected by Edward the Confessor, in whose reign the cessation of all further fear of a Danish incursion made it possible for the king to reside habitually without the protection of walls. But according to the local tradition it was Cnut or Canute who first lived at Westminster, and here

he rebuked the tide. No doubt even the king could not go a hundred yards on foot from Thorney without encountering a tide or a tidal stream. One of the rivulets, the Tyburn, here divided into a kind of delta. Two other brooks surrounded the sacred precincts of the monks, and at least two more divided the mighty Dane from the wide mere of St James's Park. And all these were tidal, as the name of one of them, Mereflete, denotes. Notwithstanding the lowness of the situation thus described, it became the chief residence of successive kings, and, in consequence, the headquarters of the courts of law. The king himself at first heard cases, and, theoretically, continued to hear them until a very late period, seated in the hall of the palace surrounded by his chaplains, who advised him on points of law. The king's exchequer, too, sat in the same place, and certain barons were early appointed to see to matters relating to the royal revenue. There are many other things which connect Westminster with our legal history, but this is not the place in which to detail them. The palace, probably from the time of the Confessor, if not before it, had numerous great public chambers and halls, where cases could be heard, where money could be received and placed in safety, where great court functions could be carried out, where ambassadors could be entertained, and banquets given to hundreds of guests together.

As the centuries went on these chambers formed not a homogeneous house of compact plan such as might be our conception of a palace, but a village of single apartments, such as the Painted Chamber, the Whitehall, the White Chamber, the Star Chamber, the Court of Requests, St Stephen's Chapel, and the Great Hall. To the westward of the Great Hall were the law-courts, and to the north and east the royal apartments. William Rufus rebuilt the Confessor's hall on an immense scale, with round-headed double windows like those still to be seen in the White Tower, some of which are still in existence, but covered up in the masonry at the south-eastern corner. There was a flat roof, supported by rows of oak pillars. Henry III. improved the palace greatly, but kept to the ground-plan laid down by the Confessor. Richard II. transformed the hall. Leaving the old walls standing, he buttressed them strongly, and raised over them the magnificent roof of oak which had to be renovated and reinforced with steel (1914-23). It is 92 feet high. The length of the hall is 290 feet, its breadth 68 feet. In 1512 a fire took place in the royal apartments, and Henry VIII. removed the court first to Bridewell and then to Whitehall, but the law-courts remained at Westminster, as did, oddly enough, the royal nursery, which so closely adjoined the hall that, before the courts were pulled down, the judges' robing-room of the Queen's Bench was the last of the nursery series, adorned with pictures of Heaven, Paradise, Purgatory, and Hell, after which each room was called.

The law-courts were fixed in Westminster Hall in 1224. They were frequently rebuilt, but were finally swept away without due consideration, the old buttresses being left bare, and many ancient remains destroyed under the ignorant idea that they formed no part of the original building. On part of the site of the old law-courts there is now a statue of Oliver Cromwell. (For the Royal Courts of Justice, see LONDON.) Many of the greatest events of English history, and all the greatest pageants have had their place in this old hall. Here the throne was set up for Henry Bolingbroke to ascend as soon as the constituent assembly had proclaimed the deposition of Richard II. Here Sir John Oldcastle, Lord Cobham, was tried and condemned. Here successively, the Duke of Somerset and his rival, the Duke of Northumberland, and a little later, the Duke of Norfolk, were all tried and condemned. Here Strafford was condemned in the same place occupied by his royal master a few years later. The seven bishops were here acquitted, and here the trial of Warren Hastings, the cause of so much wasted eloquence and turgid rhetoric, dragged on wearily for seven long years. In 1834 a conflagration was caused by careless workmen, who, having orders to destroy some fagots of obsolete 'tally sticks,' burned them in the stove of the House of Lords (the old Court of Requests). The result was the destruction of all that remained of the ancient palace, except the hall, the cloister of St Stephen's Chapel, and the crypt. All were worked into Sir Charles Barry's new design for the Houses of Parliament; but the ancient features of the crypt have since been removed, and the curious little chapel of St Mary Undercroft, which dates from the reign of Edward I., has been rather garishly restored. It is generally known as St Stephen's Crypt. The whole design of Sir Charles Barry was formed upon the necessity of preserving Westminster Hall, and of making the new building to conform to it. The result is, with the single exception of Windsor Castle, the most successful attempt to build in a revived Gothic style. The best parts are the interior courts where there is no ornament, but where the symmetry is very marked. The way in which the old hall is worked in is masterly, the more so as, when we look at the plan, but only when we look at the plan, we perceive that it is not parallel with any of the new buildings. Eastward of the hall the old cloisters of 'fanwork' vaulting are utilised as an entrance-gallery for the members of the House of Commons, and have a doorway opening into the hall. At the south end, on the site of St Stephen's Chapel, St Stephen's Hall (with historical mural paintings unveiled in 1927) forms a grand entrance for both Houses, a beautifully groined gallery, with some interesting statues by Foley, and some others, leading to the Central Hall, a fine octagon, never fully completed. From this point galleries more or less spacious, ornamented with frescoes, lead on the left to the House of Commons, and on the right to the House of Lords. The former is a handsome chamber approached by a lobby, which forms a cube of 45 feet, the House itself being 90 feet by 45, and 45 high. Some modifications of these dimensions have been made from time to time to improve the acoustic qualities of the chamber. The Perpendicular style is rigidly adhered to all through. Turning southward we reach the Peers' Lobby, which is of the same dimensions as the other, but a blaze of gilding and colour. The House of Lords is also very gorgeous, with figured windows, frescoes by Dyce and others, arms of successive chancellors in colour, bronze statues of the barons who extorted Magna Charta, and at one end, under a gilt canopy, the throne, flanked by smaller seats intended originally for Prince Albert and the Prince of Wales. In the centre is the Lord Chancellor's seat, known as the 'Woolsack.' On either side behind the throne are doors which lead into the Princes' Chamber, a kind of robing-room, and beyond it we reach the great and unmeaning Royal Gallery, the object of which is not apparent, unless it be to exhibit the skill of Maclise, who painted on its walls gigantic frescoes of the 'Death of Nelson,' and the 'Meeting of Wellington and Blücher after Waterloo.' The Victoria Tower is 75 feet square, and rises to a height of 336 feet. The Clock Tower, at the other end, has 'Big Ben' (a bell weighing 13½ tons).

Westminster Bridge as we see it is not a very interesting structure, being chiefly constructed of

cast-iron. The first bridge here was opened in 1750. It was very picturesque, and figures in some of Turner's pictures, as well as in Wordsworth's sonnet. The architect was Labelye, a Swiss. The Thames is, as we saw above, very wide here, and the bridge was at least 300 feet longer than London Bridge. The present bridge was designed by Page, and completed in 1862. Many great changes have taken place in Westminster since the middle of the 19th century. The clearing out of back slums, and the completion of Victoria Street, created a quarter of rather fashionable shops and residences. Just out of Victoria Street, in old Tothill Fields, is the new Roman Catholic Cathedral (1895–1903) in Early-Christian Byzantine style, with a campanile 284 feet high. In the Millbank district, also, many improvements have been made. The Tate Gallery of British Art (1897) was erected on the site of a penitentiary; and the Thames Embankment has been extended from the gardens adjoining the Houses of Parliament to Lambeth Bridge, which is being rebuilt by the London County Council. And this embankment is to be connected with an older one which goes nearly to Vauxhall Bridge. In the Caxton Hall there are preserved thousands of manuscript books and records, extending from 1464 to the present day. Several charters, the earliest being dated in the fortieth year of Henry III., 1256, are in the Westminster City Hall. By various Reform Acts the old borough of Westminster, which was nearly conterminous with the ancient boundaries of the abbot's manor, was divided, and Westminster now has two parliamentary divisions, each with one member, as previously mentioned.

Of the numerous books on Westminster may be mentioned Widmore, *Enquiry into the Time of the First Foundation of Westminster Abbey* (1743); Bardwell, *Westminster Improvements* (1839); Brayley and Britton, *The Ancient Palace and Houses of Parliament* (1836); Ackermann, *Westminster Abbey* (1812); Neale and Brayley, *Westminster Abbey* (1818); Dart, *Westminster Abbey* (n.d.); Sir Gilbert Scott and others, *Gleanings from Westminster Abbey* (1863); Dean Stanley, *Memorials of Westminster* (1868); W. J. Loftie, *Westminster Abbey* (2d ed. 1891); Sir W. Besant, *Westminster* (1895); Lethaby, *Westminster Abbey and the King's Craftsmen* (1906); Bond, *Westminster Abbey* (1909); and books on the school by Forshall (1884), Barker and Stenning (1893), Sargeaunt (1898), Airy (1902), Tanner (1924).

WESTMINSTER ASSEMBLY, or Assembly of Divines, appointed by the Long Parliament for settling the doctrine and government of the Church of England, consisted of 121 clergymen and 30 laymen—10 of whom were lords and 20 commoners—together with 4 clerical and 2 lay commissioners from the Church of Scotland. Among the more distinguished of the divines were Usher, Saunderson, Reynolds, Brownrigg, Ward, Twisse, Lightfoot, Gataker, Burges, Goodwin, Calamy, and Nye; of the laymen, Selden, Prideaux, the two Vanes, Rouse, Pym, Whitelocke, St John, and Maynard. The Scottish divines were Henderson, Gillespie, Rutherford, and Baillie. Thirty-five of those whose names were contained in the ordinance calling the Assembly, which was dated 12th June 1643, never appeared at the discussions, one or two of them having died about the time of the first meeting, and the others fearing the displeasure of the king. To supply the place of these absentees, some additional members, called the superadded divines, were summoned to attend. This notable Assembly held its first meeting on 1st July 1643, and continued to sit till 22d February 1649, during which time it met 1163 times. Its most important work was concluded long before. One of the first things it did was to sanction the *Solemn League and Covenant*, against which Dr Burges alone stood out for several days. The Presbyterians formed a large majority, and exercised a corresponding influence. In doctrine the members were almost unanimous; but on the subject of church government opinions extremely opposite were maintained with keenness, especially on the question touching the sphere and limits of the civil power in matters ecclesiastical. The principal fruits of its deliberations were the *Directory of Public Worship*, submitted to parliament April 20, 1644; the *Confession of Faith*, October and November 1646; the *Shorter Catechism;* and the *Larger Catechism*, 22d October 1647. These several formularies, which contain a clear and rigid embodiment of Calvinistic theology and Presbyterian church government, constitute to this day the authorised Presbyterian standards. The *Directory of Public Worship* was ratified by both Houses of Parliament, October 2, 1644, and the doctrinal part of the *Confession of Faith* in March 1648.

See Baillie's *Letters;* Lightfoot's *Journal;* Hetherington's *History of the Assembly* (1843; 6th ed. 1891); Masson's *Milton* (vol. ii. 1871); Gardiner's *History of the Civil War* (3 vols. 1886–91); *Minutes of the Assembly*, edited by Mitchell and Struthers (1874); A. F. Mitchell's *Baird Lectures* (1882). See also CONFESSIONS, COVENANT, PRESBYTERIANISM.

Westmorland, a northern county of England, bounded by Cumberland, Durham, Yorkshire, and Lancashire. With a very irregular outline, it has an extreme length from north to south of 32 miles, an extreme breadth from east to west of 40 miles, and an area of 505,864 acres or 790 sq. m. The surface is mountainous, the highest summits being Helvellyn (q.v., 3118 feet) on the Cumberland boundary, Bow Fell (2959), Fairfield (2950), Dufton Fell (2803), and Dun Fell (2780). The western portion of the county belongs to the Lake District (q.v.), its lakes including Windermere (q.v.) on the boundary with Lancashire, and Ullswater (q.v.) on that with Cumberland, besides Grasmere, Howes Water, Rydal Water, &c. The moorlands —to which Westmorland owes its name—are numerous and extensive; but along the courses of the Kent in the south and the Eden in the north (the principal streams) there are tracts of fertile land. The chief crop is oats, and cattle-raising is carried on. The climate is moist and mild, but with often much snow in winter. Coal, lead, copper, slate, and graphite are the chief mineral productions. Westmorland is in the diocese of Carlisle. Its towns are Appleby, Ambleside, Kendal, and Windermere. It returned, till 1918, one member for each of its two divisions—Appleby and Kendal; thereafter one for the whole county. Worthies, besides those noticed under the LAKE DISTRICT, have been Bernard Gilpin, Catharine Parr, Ann Clifford, Countess of Pembroke, Bishop Watson, and Sir J. G. Wilkinson; and Clifton Moor was the scene of a Jacobite skirmish (1745). Pop. (1801) 40,805; (1841) 56,454; (1881) 64,191; (1921) 65,746. See works cited at LAKE DISTRICT; and *History* by R. S. Ferguson (1894).

Weston-super-Mare, a fashionable watering-place of Somersetshire, on the Bristol Channel, 20 miles SW. of Bristol. Grown from a fishing-village since 1805, it is sheltered by rocky, fir-clad Worle Hill (357 feet); commands a splendid view over to Wales; and has an esplanade (begun 1825) 3 miles long, promenade piers, the Prince Consort Gardens, parks, a sanatorium, potteries, &c. Pop. (1851) 4034; (1901) 19,047; (1921) 31,653.

Westphalia, a name given to a duchy and a kingdom, and now to a Prussian province, is derived from the *Westfalen*, a western tribe of Saxons, dwelling in the region of the Ruhr and Lippe rivers, as distinguished from the Ostfalen, near the Elbe. About 1180 it came under the Archbishops of

WEST INDIES
English Miles
Kilometres
Tropic of Cancer
Longitude West 70 of Greenwich
GULF OF MEXICO
ATLANTIC OCEAN
CARIBBEAN SEA
FLORIDA
BAHAMA ISLANDS
Great Bahama Bank
Great Abaco I.
Eleuthera I.
Cat Island.
San Salvador or Watlings I.
Long I.
Crooked I.
Acklin
Mariguana
Caicos Passage
North Caicos
Grand Caicos
Caicos Is.
East Caicos
Turks Is.
Great Inagua
Silver Bk Passage
Silver Bank
Mouchoir Passage
Caicos Bank
Caicos Bank
Amboyna Cay
Mathew Town
Hogsty Reef
Little Inagua
Miraporvoos
Gr Ragged I.
Rum Cay
Samana
Fiona Cays
Water Cay
Little Exuma
Exuma Sound
Conception I.
Crooked I. Passage
Tropic of Cancer
CUBA
Isla de Pinos
Cayo del Rosario
Cayo Largo
Cayo Lorito
Trinidad
Cienfuegos
Matanzas
Habana
Habana Province
Archipiélago de los Canarreos
Archipiélago de Sabana
Archipiélago de los Colorados
Archipiélago de los Jardines
Jardines de la Reina
Cayo Romano
Cayo Coco
Cayo Guillermo
Cayo Santa Maria
Cayo Sabinal
Cayo Francés
Cayo Confites
Cayo Paredon Grande
Cayo Blanco
Cayo Cruz del Padre
Cayo Breton
Cayo Largo
Cayo Lobos
Cayo Romano

Cologne, as Dukes of Westphalia. It was the headquarters of the Vehmgerichte (q.v.). Under the Emperor Maximilian part of old Westphalia with parts of Oldenburg and Hanover was made a 'circle' of the empire; while the duchy fell into the circle of the Lower Rhine. In 1801 all the country west of the Rhine was made over to France, and the duchy granted to the Duke of Hesse-Darmstadt as compensation for his losses to the west of the Rhine. In 1807 Westphalia, with parts of Hesse, Hanover, Brunswick, and Saxony, was made into a kingdom for Jerome Bonaparte, and designed to be the centre of the Confederation of the Rhine (q.v.). In 1813 the kingdom came to an end, and the Congress of Vienna assigned the present province of Westphalia to Prussia. This province has an area of 7806 sq. m. and a pop. (1925) of 4,826,885; Roman Catholics are in the majority. The northern portion belongs to the great north German plain, and is not fertile; the south is hilly, with fertile valleys. Cereals and potatoes are grown, and Westphalian hams are still in high repute; but Westphalia's vast and peculiar wealth lies in its mineral treasures—coal, iron, zinc, copper, sulphur, with lead, antimony, &c. Iron-working is largely carried on, and linen-weaving has been an important industry since the 14th century—Bielefeld being the great centre. Münster has cotton-works. See general books in French by Guyot (1915), and in German by Milert (1920–21).

The peace of Westphalia, concluded at Münster and Osnabrück, 24th October 1648, brought the terrible Thirty Years' War (q.v.) to an end. The main advantage to the Protestant party was the securing of religious toleration. Both parties agreed to abide by the distribution of territories as at 1624. The Lower Palatinate was restored to the son of the Elector Palatine; the Upper Palatinate to Bavaria. Part of Alsace was definitely ceded to France; western Pomerania, Bremen, and Verden fell to Sweden, which in virtue thereof became a member of the Holy Roman Empire. Brandenburg and Hanover obtained some secularised church lands; and the independence of Holland and Switzerland was formally recognised. The sovereignty of the different states of the empire was recognised to an extent that seriously weakened the strength and unity of the empire.

West Point, site of the United States Military Academy, and of a ruined fortress dating from the war of independence, on the west bank of the Hudson River, 48 miles by rail N. of New York. The Military Academy is on a plateau of 200 acres about 188 feet above the river, surrounded by the bold scenery of one of the finest river-passes in the world. The forts and a river chain were taken by the British in 1777, but abandoned after Burgoyne's surrender, and stronger forts were built under the direction of the Pole, Kosciuszko; these General Arnold bargained to betray—a plot foiled by the arrest of Major André. The academy was formally established in 1802. Education there is gratuitous, the government allowing the cadets $780 per annum, plus a daily allowance for rations. The cadets, the maximum number being fixed at 1378, are organised for military purposes into a battalion of four companies, officered from among themselves, and the discipline is exceedingly strict. Military engineering takes the most prominent place in the four years' course. The year lasts from 1st September to 4th June, while the cadets are encamped for military training from 15th June to 30th August. The standard of education is very high. The entrance examination, though confined to the common English branches, is so severe that many candidates each year are rejected; and of those that enter few over half ever graduate. In 1899 the Cullen Memorial Hall was finished, and in 1910 large new barracks were erected, while there are various monuments to soldiers and generals in the grounds.

See Boynton, *History of West Point* (1863); Irving Hancock, *Life at West Point* (1903); and books by Richardson (1918), and Earle (1918).

Westport, a seaport of County Mayo, at the head of Clew Bay, 13 miles SW. of Castlebar by rail, with trade in agricultural produce; pop. 3500.

West Prussia. See PRUSSIA (WEST).

West Troy. See WATERVLIET.

West Virginia, one of the states of the American Union, the fortieth in area and twenty-seventh in population, is known as the Panhandle State, and is visibly the most irregular in form of all the states. Nearly all the boundary lines follow the courses of rivers or the crests of mountain-ranges. In the north a narrow wedge-shaped strip of land, called the 'Pan-handle,' projects along the Ohio River between the states of Ohio and Pennsylvania. The eastern edge of the 'Pan-handle' and a portion of the northern boundary adjoin Pennsylvania. The remaining portion of the northern boundary is formed by the Potomac River, which separates the state from Maryland; and that state also forms a part of the eastern boundary. Virginia lies to the south and south-east, and on the west are Kentucky and Ohio. Land area, 24,022 sq. m.

In the north-east a small portion of the state belongs to the Shenandoah valley. Thence westward and south-west to the Big Sandy River stretches a narrow belt, called the 'mountain region,' formed by the western ridges of the Appalachian system. This portion of the state consists of sharp parallel ranges interspersed with narrow fertile valleys which increase in width toward the west. In the north the streams are tributary to the Potomac, but toward the south they frequently cut through the mountain-ridges in deep gorges, flowing toward the west or north-west to the Ohio River. The massive sandstone summits of the mountains have been so cracked and fissured by the original upheaval and by subsequent erosive action upon the softer strata beneath that the streams have carved cañons in some cases nearly 1000 feet in depth. To the west of this region lies a broad belt known as the 'hilly region,' a portion of the Appalachian or Cumberland plateau. It has suffered a vast amount of denudation, and its diversified structure is entirely the result of erosion. It comprises a multitude of hills with V-shaped depressions in which the streams flow, generally toward the west. If the streams follow a north and south course, they cross this elevated region in deeply eroded valleys and cañons. In some cases there are fertile bottom lands of considerable extent, and the hills above the valleys form broad flat-topped plains, surmounted, where some outcropping rocks have resisted the destructive agencies of rain and frost, by elevations which are higher than portions of the mountain region. There is a gradual descent toward the Ohio River, which, however, throughout much of its course flows between high sharp-backed hills. Some two-thirds of the state is well wooded, and the timber resources are of great importance. The climate is free from extremes, and is remarkably healthful. The abundance and equable distribution of the rainfall, together with the general fertility of the soil, afford excellent opportunities for agriculture: Indian corn, oats, potatoes, fruits, and tobacco are grown. In the mountain region there is an abundance of fine pasturage; the annual product of butter and cheese is very large, while West Virginia is especially famous for wool. In mineral production, the state ranks second only to Pennsylvania. The great Appalachian coalfield

covers almost the entire state, and in area it is much greater than the whole coal region of Great Britain. Over 100,000,000 tons are produced annually, the coal being of the highest quality and embracing all grades. The erosion of the surface, already mentioned, has left the coal seams in such condition that they may be worked with great economy, and the increased facilities for transportation have greatly stimulated mining operations. Petroleum, natural gas, and salt are also extremely important. There are valuable manufactures of iron and steel, leather, flour, cigars, pottery, &c., while the lumber trade is very large. There is a considerable amount of water-power available. In the south and south-east are sulphur and other mineral springs.

The state contains fifty-five counties, and returns six representatives to congress. The chief cities are Wheeling (pop. in 1920, 56,208), Huntington (50,177), and Charleston, the capital (39,608). There is an efficient system of free public schools and normal schools. At Morgantown is situated the state university (founded 1868), and there are numerous private schools and several institutions of higher learning. Until the time of the secession of Virginia that state included West Virginia; but the inhabitants of the northern and western counties remained loyal to the federal government, and in 1863 West Virginia was admitted to the Union as a separate state. Pop. (1870) 442,014; (1900) 958,800; (1920) 1,463,701.

Westward Ho, on the coast of North Devon, 2½ miles W. of Bideford, owes not merely its name but its existence to Charles Kingsley's Elizabethan romance (1855), which attracted swarms of visitors to North Devon. For their accommodation this pretty cluster of villas and lodging-houses, with its church, hotel, club-house, and college, has sprung up since 1867. The bathing facilities are excellent, and it is a great resort of golfers. The village is in the parish of Northam.

Wet Bulb. See HYGROMETER, THERMOMETER.

Wetherell, ELIZABETH. See WARNER, SUSAN.

Wetstein, JOHANN JAKOB, a great New Testament scholar, was born in Basel, March 5, 1693. At an early age he gave himself to the studies of his life, and after travelling in France and England he returned in 1720 to become assistant to his father in St Leonard's Church at Basel. He continued the study of the New Testament text, and his boldness and originality soon brought him under suspicion of heterodoxy. His rejection of the *θεός* for *ὅς* in the *textus receptus* of 1 Tim. iii. 16—now admitted by all who know anything of exegesis—was denounced as an attempt to destroy one of the buttresses of Christ's divinity, and Wetstein was deposed for alleged Socinianism (1730). But in 1733 he was called to the chair of Church History in the Remonstrants' College at Amsterdam, and there he lived till his death, March 22, 1754. The prolegomena to his famous edition of the Greek Testament appeared anonymously in 1730; the text followed in two volumes folio, 1751–52. See L. Meister, *Helvetische Szenen der neueren Schwärmerei und Intoleranz* (1785).

Wette. See DE WETTE.

Wetter, LAKE. See VETTER.

Wetterhorn ('Peak of Tempests'), a lofty mountain of the Bernese Oberland, east of the Grindelwald, 10 miles SE. of the Lake of Brienz. The three peaks of the Wetterhorn are respectively 12,149, 12,166, and 12,110 feet high, and were first ascended in 1844 and 1845.

Wettin. See SAXONY, SAXON DUCHIES, WINDSOR (family), EDWARD VII., GEORGE V.

Wetzer, HEINRICH JOSEPH, joint-editor with Benedikt Welte of the great Roman Catholic theological encyclopædia, was born at Anzefahr in Hesse, 19th March 1801, studied at Marburg, Tübingen, and Paris, became professor of Oriental Philology at Tübingen in 1830, and died in Freiburg, 5th November 1853. He began the publication of the *Kirchen-Lexikon der Katholischen Theologie* in 1846; the 12th volume appeared in 1860. A new edition was begun by Hergenröther, and continued by F. Kaulen (1882 *et seq.*).

Wetzlar, a town of Rheinland, charmingly situated on the river Lahn, 40 miles N. of Frankfort-on-the-Main. The Gothic cathedral, dating mostly from the 13th century, was restored in the 20th; the nave is used by the Protestants and the choir by the Roman Catholics. There are ironworks and manufactures of optical instruments. Pop. (1925) 16,517. Wetzlar was a free imperial town 1180–1803, and was the seat of the supreme law-courts of the empire 1689–1806. It was also the scene of the *Sorrows of Werther*, and some Goethe relics have been preserved.

Wexford, a maritime county of the province of Leinster, bordering on Wicklow, Carlow, Kilkenny, and Waterford; greatest length, 55 miles; greatest breadth 30 miles; area, 580,950 acres. The coast-line is irregular, and very dangerous for shipping. The headland called Carnsore Point is the south-eastern extremity of Ireland. The greater part of the surface is level, but Mount Leinster, the highest point of the mountains of the border, is 2610 feet high. The principal river is the Slaney, which enters the sea through Wexford Harbour; the Barrow is part of the boundary. In its geological structure Wexford belongs to the eastern clay-slate tract; granite is found in the south-east of the county, and in some of the detached hills, as are also beds of greenstone. The soil varies from light and sandy to stiff clay, but the county has a verdant luxuriance. There are but few and inconsiderable manufactures, and the trade is chiefly in the export of agricultural produce, especially barley; butter, cattle, pigs, poultry, and eggs are also exported in large quantities. The fisheries are valuable. The principal towns are Wexford, Enniscorthy, New Ross, and Gorey. The maritime position of Wexford laid it open early to the incursions of the Danes. It was the first landing-place of the English, and formed part of the tract granted to them by MacMurrough. During the civil wars which followed 1641 Wexford was the scene of frequent contests; and in the insurrection of 1798 it formed the theatre of the only formidable conflicts of the peasantry with the regular troops. There are numerous relics of antiquity, Celtic as well as Anglo-Norman, including many old castles, and the monasteries of Dunbrody, Tintern, and Ross. Wexford returns five members to the Dáil. Pop. (1841) 202,196; (1861) 143,594; (1881) 123,854; (1901) 104,104; (1926) 95,812.

WEXFORD, the capital, a seaport and municipal borough, is situated at the mouth of the river Slaney, 93 miles S. of Dublin by rail. The estuary of the Slaney forms Wexford Harbour, which, though spacious, is shallow and impeded by a bar. The town has several churches, Catholic and Protestant, convents, and conventual schools. Parts of the old fortifications and of St Selsker's priory remain. The town is extremely ancient, and was occupied by the Danes as one of their strongest settlements; and from the time of the invasion it became an English stronghold against the native population. During the civil wars of 1641 it was occupied by the confederated Catholics, but was taken by Cromwell in 1644. The insurgents of

1798 also had possession of it for a short time. Pop. (1926) 11,870. See Hore, *History of Wexford Town and County* (6 vols. 1900–11).

Weyden, Rogier van der (1400–64), Flemish painter, born at Tournai, was a successor of the Van Eycks. See the monograph by Wauters (1856).

Weygand, Max, French general, was born at Brussels in 1867. He entered the cavalry, and during practically the whole of the Great War was Chief of Staff to Marshal Foch. In 1920 he led the Poles to victory against the Bolsheviks, and 1923–24 was High Commissioner in Syria. He combines the powers of quick initiative and able organisation.

Weylar y Nicolau, Valeriano, Marqués de Tenerife, Spanish general, was born at Palma, Majorca, in 1838, and was military attaché of the Spanish Legation to the United States during the Civil War. He served brilliantly during the Cuban rebellion 1868–72, and against the Carlists 1875–76. He was then appointed captain-general of the Canary Islands, later of the Balearic Islands, and 1888–92 of the Philippines. After a short spell as captain-general of Catalonia he was sent to crush the rebellion in Cuba (q.v.) in 1896, but his ruthless policy of repression caused his recall the next year. In 1900 he was made captain-general of Madrid, and Minister of War 1901–2 and 1905–6.

Weyman, Stanley John, born at Ludlow, 7th August 1855, was educated at Shrewsbury and Christ Church, Oxford, and became a barrister. In 1890 he published *The House of the Wolf*, in 1891 *The Story of Francis Cludde*, and made himself famous in 1893 by *A Gentleman of France*. Later stirring historical romances are *Under the Red Robe* (1894), *My Lady Rotha* (1894), *Memoirs of a Minister of France* (1895), *The Red Cockade* (1895), *The Abbess of Vlaye* (1904). After *The Wild Geese* (1908) he published nothing till *The Great House* (1919), the precursor of *Ovington's Bank* (1922) and other social novels.

Weymouth, a fashionable watering-place and a municipal borough of Dorsetshire, 7½ miles S. of Dorchester, 77 S. of Bristol, and 145 WSW. of London (128 by road). It lies at the mouth of the little Wey, on a beautiful bay, bounded E. by St Albans Head and W. by the 'Isle' of Portland (q.v.), and here divided by the projecting Nothe into Weymouth Bay and Portland Roads. The Wey, after widening into the 'Backwater,' enters the sea, and separates the two quarters of the town—old Weymouth proper on the south, and modern Melcombe-Regis, facing the bay, on the north. Both were separate boroughs till 1571, and they still returned two members apiece till 1832, then two conjointly till 1885. A bridge, reconstructed in 1881, connects them; and Melcombe-Regis, which rose into repute through George III.'s frequent visits from 1789, has excellent sands, an esplanade over a mile long, statues of King George (1809), Queen Victoria, and Sir H. Edwards (1885), numerous hotels, and a pile pier (1859). The Nothe has been strongly fortified since the Crimean war. There is some shipping, steamers running between here and the Channel Islands, and an export trade in Portland stone and Roman cement. Thomas Love Peacock was born here, and here Southey first saw the sea. Pop. (1851) 9458; (1891) 13,769; (1921) 24,570.

Weymouth, a town of Massachusetts, on Massachusetts Bay, 12 miles by rail SSE. of Boston, with large factories of boots and shoes, and locomotives. There are also oil-refineries and shipbuilding yards. Pop. (1920) 15,057.

Whale. The name may be taken as equivalent to Cetacean, and applied to any member of that order of mammals, which includes two great sets: the toothed whales, such as Sperm-whale and Dolphin, and the whalebone whales, such as Right Whale and Rorqual, in which the teeth are only embryonic. The general characters of the order are summed up in the article Cetacea (q.v.). The order Cetacea is usually divided into three sub-orders: (1) the Mystacoceti or Balænoidea, baleen or whalebone whales; (2) the Odontoceti or Delphinoidea, toothed whales; and (3) the Archæoceti or extinct Zeuglodonts. The differences between the extant sub-orders are so great that any idea of close relationship must be abandoned; their common ancestry must be far back, and indeed it is doubtful whether our classification might not be brought nearer the truth by recognising two distinct orders. Less specialised than the modern types are the extinct Zeuglodonts of the Eocene period, but it is by no means certain that they should be included within the order Cetacea.

Baleen Whales.—Baleen consists of a double series of 300 to 400 horny plates, which grow from the palate and hang down into the mouth. Each plate is somewhat triangular, the base being rooted in the palate; both apex and inner edge are frayed into hairy shreds. These plates grow from parallel ridges on the palate, which are covered with long vascular papillæ. These papillæ become horny

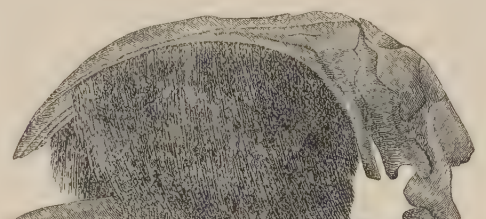


Fig. 1.—Skull of Arctic Right Whale, showing baleen plates in position.

and fuse together to form the plates. The whale is wont to swim with open mouth through shoals of pelagic animals; having secured a good mouthful, it closes its jaws, raises its tongue, allows the water to strain out at the sides through the baleen plates, on the edges of which the food is caught. Thence it is swallowed. In short, the apparatus serves as a strainer or sieve.

There are five extant genera of baleen whales, of which the best known are the Right Whales (Balæna) and the Rorquals (Balænoptera). In the genus Balæna the skin of the throat is smooth, there is no dorsal fin, the neck vertebræ are fused, the fore-limb is short, broad, and five-fingered, the head is very large, the baleen plates are very long, narrow, and black. The Greenland or Arctic Right Whale, or Bowhead (*Balæna mysticetus*), of circumpolar distribution, measures 45 to 50 feet in length, the head forming more than one-third of the whole. It surpasses every other species both in quantity of oil and in length, quantity, and quality of whalebone, a large example yielding 275 barrels of the former, and 1¾ ton of the latter. The blubber may be 16 inches in thickness. The huge animal feeds for the most part on very minute crustaceans. The Southern Right Whale (*B. australis*) inhabits the temperate seas of both hemispheres, apparently with local varieties in different regions. In many ways it resembles the Arctic species, but has a relatively shorter head, shorter baleen, and a different body contour. The 'Humpback' (*Megaptera*

boops) is about the same size as the Arctic right whale, but has the skin of the throat plaited, a low hump-like dorsal fin, free neck vertebræ, very long and narrow four-fingered pectoral limbs, a head of moderate size, short and broad baleen plates. It is common in the North Atlantic between Norway and Greenland, and occasionally visits British coasts. Other forms, perhaps of the same species, occur in the South Atlantic and in the Pacific. For Balænoptera, see RORQUAL,

Fig. 2.—Arctic Right Whale.

The two other extant genera of Balænoidea are represented by the rare *Neobalæna marginata* from Australian seas, the smallest of whalebone whales, not exceeding 20 feet in length; and *Rhachianectes glaucus*, the Gray Whale of the North Pacific, from 35 to 40 feet long.

Toothed Whales.—The Odontoceti are represented by many more forms than the Mystacoceti, and there is a much greater diversity of type. The Cachalot, or Sperm Whale (*Physeter macrocephalus*), the only representative of its genus, is a huge Cetacean widely distributed in 'schools' in tropical and subtropical seas. 'The length of the full-grown male is from 55 to 60 feet, but the female is stated not to reach more than half that size.' The lower jaw bears on each side twenty to twenty-five strong, conical, recurved teeth, fixed in a long groove and not in distinct sockets; the shape of the skull is very unlike the shape of the head, for while there is a very long rostrum and a deep

Fig. 3.—Cachalot, or Sperm Whale.

basin-like concavity on the upper surface of the skull, the head is rounded and truncated in front; the bulk of the head above the cranium consists of tough fat or 'junk,' but above this there is a large 'case' containing fluid oil and a granulated substance which yields 'spermaceti;' there is a very long mandibular symphysis; the head is about a third of the total length; the somewhat sigmoid blow-hole is at the anterior end of the head, slightly to the left side; the mouth is ventral behind the end of the snout, the lower jaw may be let down almost at right angles to the upper, and the gape is thus enormously wide; the throat, unlike that of the baleen whales, is also wide, sufficient it is said to admit a man's body; the pectoral limbs are short and broad; the dorsal fin is represented only by a low protuberance. The sperm whale feeds chiefly on cephalopods. The 'schools' may consist of hundreds, led by two or three large bulls; the females often endanger their own safety in aiding their offspring to escape; the bulls sometimes fight desperately with one another, or with their persecutors, and are said to sink not only boats, but even whaling vessels. Apart from oil and spermaceti, the cachalots yield 'ambergris,' an intestinal concretion of strong odour, formerly used in medicine, now restricted to perfumery. The Cachalot is not frequent on European coasts, but is said to have occurred in the Mediterranean, and has been occasionally stranded on British shores.

Within the same family as the sperm whale is the imperfectly known *Cogia breviceps*, a small whale about 10 feet in length, met with at various distant localities in the Southern Ocean, and also off the coast of Madras, and in the North Pacific; the 'Bottlenose' (*Hyperoödon rostratus*), regularly hunted in the North Atlantic, besides several other forms. Very remarkable are the fluviatile and estuarine Platanistidæ, the blind Platanista of the Ganges, Brahmaputra, and Indus, Inia in the Amazon, and Pontoporia in the estuary of the Rio de la Plata. The Delphinidæ are represented by numerous forms—e.g. the Arctic Narwhal (*Monodon monoceros*), remarkable for the enormous single tusk of the male; the Beluga (*Delphinapterus leucas*), a pure white Arctic whale occasionally coming as far south as Scotland and the St Lawrence; the Common Porpoise (*Phocæna communis*); the killer or 'Grampus' (*Orca gladiator*); the Caaing Whale (*Globicephalus melas*); the Common Dolphin (*Delphinus delphis*); and many others.

Whale 'Fishery,' as it is popularly called, seems to have originated in ancient times and independently in many parts of the world. Indians, Eskimos, Japanese, Tatars, and Norsemen were among the early whale-hunters. When the Atlantic right whale was still common, its pursuit was a recognised occupation of the seafaring folk of the Biscayan and Basque provinces, from the 10th to the 16th century. As whales became scarce in southern seas, the fishery moved northwards, and squabbles arose among the nations as to the various 'grounds,' which are now regarded as unrestrictedly international. The Dutch founded the settlement of Smeerenberg, in Spitsbergen, as a provisioning centre for the whalers and a melting-place for the whales; but by-and-by this was abandoned, for the whales were driven off and the fishery shifted to Greenland, whence the blubber was sent direct to Holland. In 1680 the Dutch had 266 ships and 14,000 sailors engaged in whaling, and for many years it was from Holland that the chief oil-supply of Europe was drawn. Soon, however, a decline set in, and towards the end of the 18th century the Dutch fishery had almost ceased. From 1732 to 1824 the British whalers were stimulated and subsidised by a government bounty of so much per ton, yet in 1815, when the British whale-fishery was in its most flourishing condition, only 164 ships were engaged in it. By 1828 the number had, however, fallen to 89 vessels, 49 of which were fitted out at Scottish ports. In that season 1197 whales were captured, the result being 13,966 tuns of oil and 802 tons of whalebone. At present Dundee and Peterhead are the chief centres of the British whaling industry, but the number of

vessels employed by the two ports is not more than 30. During the 18th century 'a new competitor had entered the field, and soon distanced all others.' In New York and Delaware, New England, and California whaling became an important industry, and as the whales retreated from persecution they were followed as far as Newfoundland. 'About 1750 the distant fishery was prosecuted with vessels of as much as 130 tons. New Bedford, destined to become the metropolis of the American whale-fishery, entered upon the business about 1755. In 1765 Boston had a hundred small vessels.' Towards the last quarter of the 18th century the whalers became more adventurous, and voyaged to the Brazil Banks, Cape Verde Islands, West Indies, &c., but further progress was stopped by the revolutionary war, and many American whalemen sought fortune in Europe. 'The first whale-ship that ventured into the Pacific was sent from England in 1787, and was manned by Nantucket men.' Subsequently the coasts of Chile and Peru and of East Africa were visited. In 1839 the American whale-fishery, after a decline, had again 557 vessels. In 1846 it had 678 ships and barques, 35 brigs, and 22 schooners, but soon after this date the fishery began to decline.

Whaling was always somewhat of a lottery. Great prizes were sometimes won—a Peterhead whaler caught in one season 44 whales, and brought home in oil and whalebone a value of £10,000; a Dundee vessel brought home 18 tons of baleen from 37 whales. But apart from the dangers of exposure, wreck, and starvation, the men who usually shipped on the profit-sharing system found that more and more frequently the vessels came home 'clean' or nearly so. And before the end of the 19th century British whaling threatened to become extinct. But new appliances and new methods, utilising whales' carcases, led to a singular revival of whale fishing on the Norwegian coasts. Formerly oil and baleen were the main sources of profit, spermaceti and ambergris being quite subsidiary. Now whale meat is preserved, meat juice is made from it, as also cattle-food and valuable fertilisers, so that all kinds of whales (even such as having little blubber and no baleen used to be accounted useless) have their economic value. Whale oil hardened is used on the continent for edible fat. The old whaling ships have been superseded by small screw steamers with numerous special appliances, including springs and buffers to lessen shock; and the old-fashioned method of throwing the harpoon by hand has yielded to harpooning by guns big enough to propel a heavy harpoon carrying a rope sufficiently stout to haul a dead whale to the surface at whatever depth it dies. Many whales used to be wholly lost by sinking after being struck. There are now contrivances to inflate the body so as to keep it afloat. The revived industry throve amazingly in Norwegian waters, but the fishers of cod and edible fishes complained that the whaling disturbed and tended to ruin their industry; for whales come inshore to feed (as well as to mate); and legislation in 1905 prohibited whaling off the Norwegian coasts. The first result was to drive the enterprising Norwegian whalers to successful ventures off the coasts of Iceland, Spitsbergen, Newfoundland, Shetland, and Ireland. Next came enterprise in southern seas. South Georgia became a centre of whale fishing in 1911. The destructive energy of whalers bids fair to exterminate every kind of whale, and its very success to annihilate the industry. Mineral and vegetable oils are now used for many purposes—e.g. 'batching' jute, for which whale-oil was once in great request. Still, however, the oil finds a ready sale, the sperm-oil of Physeter having a distinct precedence over the train-oil of the baleen whales.

See AMBERGRIS, BELUGA, BOTTLEHEAD, CAAING WHALE, CETACEA, DOLPHIN, GRAMPUS, NARWHAL, OILS, PORPOISE, RORQUAL, SPERMACETI, &c.; W. H. Flower and R. Lydekker, *Introduction to the Study of Mammals* (1891); *Standard* or *Riverside Natural History* (ed. by J. S. Kingsley), 'Cetacea,' by W. N. Lockington (Lond. 1888); Cassell's *Natural History* (ed. by P. Martin Duncan), 'Cetacea,' by J. Murie; F. E. Beddard, *A Book of Whales* (1900); J. G. Millais, *The Mammals of Great Britain and Ireland* (vol. iii. 1906); J. T. Jenkins, *The Whale Fisheries* (1921); F. V. Morley and J. S. Hodgson, *Whaling North and South* (1927).

WHALEBONE consists of the baleen plates of the Arctic and allied whales. They are, however, not bone at all in the ordinary sense of the word, but consist of an epidermic substance more resembling hair in its nature. The baleen, which occurs in triangular plates, only requires to be scraped and softened, by boiling it for ten or twelve hours, to bring it into a proper condition for use. It is then cut into strips of various sizes for the market. For some purposes whalebone excels in usefulness any other known substance, as it has great flexibility combined with lightness and strength; but its toughness, the ease with which it can be split, and its power to stand without change a heat considerably above ordinary temperatures add to its value. The high price which whalebone has reached precludes the possibility of its being used so extensively as it was in former years. It is still made into hairbrushes, brushes for street-sweeping machines, for cleaning flues, and for other purposes in which they are subjected to much tear and wear. Dressmakers and milliners also employ it to a limited extent. Steel wires, as they take up less room, took the place of whalebone for umbrella frames about the middle of the 19th century. The earlier whalebone umbrella-stretchers were as much like spokes of wheels as wires. For other purposes steel, vulcanite, and cane are substitutes for whalebone, but in some cases only indifferent substitutes. An average-sized Arctic whale yields about 10 cwt. of whalebone.

Whale-louse.

Whale-louse (*Cyamus*), a genus of Crustacea, of the order Amphipoda and sub-order Læmodipoda, parasitic on the skin of Cetaceans. The body is broad and flat, the abdomen is rudimentary, the appendages are short, stout, and for the most part clawed. By means of these claws they attach themselves to whales, sometimes almost covering the skin, so that the animal appears whitish. See PARASITIC ANIMALS.

Whalley, EDWARD, regicide. See GOFFE.

Wharfe, a river of the West Riding of Yorkshire, flowing 80 miles ESE. past Ilkley, Otley, and Tadcaster, to the Ouse near Selby.

Wharncliffe, LORD (1776–1845). James Archibald Stuart Wortley Mackenzie was educated at Eton, served in the army, and entered the House of Commons in 1797. As a Tory he opposed Catholic emancipation, but was one of the 'waverers' who helped to pass the Reform Bill, having been created a baron in 1826; he opposed Peel's Free Trade till his death. His name is remembered in connection with 'Wharncliffe Meetings'—meetings of public companies under a standing order of the House of Lords introduced by him. Under this 'Wharncliffe Order' proceedings for the modification of the powers of a company constituted by act of parliament cannot be instituted in the House of Lords till it is reported that a special

meeting of the proprietors has been called under specified conditions of publicity.

Wharton, EDITH, American novelist, was born at New York in 1862, and published her first volume of short stories in 1899. In her novels, *The House of Mirth* (1905) the scene of which is laid in New York, *The Fruit of the Tree* (1907), *The Custom of the Country* (1914), *The Age of Innocence* (1920), *Here and Beyond* (1926), she displays great analytical power, psychological acumen, and a polished style. She has largely lived abroad, and has also written on Italy, Morocco and France.

Wharton, GRACE, the pen-name of Mrs Katherine Thomson (*née* Byerley; died 1862), authoress of Lives of Raleigh (1830), Sarah, Duchess of Marlborough (1838), and the Duke of Buckingham (3 vols. 1860), *Memoirs of the Jacobites* (3 vols. 1845–46), &c. With Philip Wharton, pen-name of her son, John Cockburn Thomson (died 1860), she published *Queens of Society* (2 vols. 1860) and *Wits and Beaux of Society* (2 vols. 1860).

Wharton, PHILIP WHARTON, DUKE OF, was the son of Thomas Wharton (1640–1714), who in 1706 was created Earl, and in 1714 Marquis, of Wharton—an eminent Whig statesman, the reputed author of *Lillibullero* (q.v.), and Lord-lieutenant of Ireland from 1708 until after the fall of the Godolphin administration in 1710. Macaulay says he was licentious and corrupt; but the faults of his Irish administration were largely redeemed by his appointment of Addison as Chief-secretary. Philip, born in December 1698, was educated at home by his father, who aimed at making him a great orator, a Whig in politics, and a Presbyterian in religion. In a boyish freak he contracted a Fleet marriage with the daughter of a Major-general Holmes. The shock is said to have killed both his parents. Wharton soon parted from his wife, and in 1716 went abroad with a French Huguenot tutor, to be brought up at Geneva. He contracted debts, spurned the restraints of his tutor, and running away to Avignon accepted, it is said, from the Old Pretender the title of Duke of Northumberland. He next visited Paris, and after various extravagances set out for Ireland, where, minor though he still was, he was allowed to take his seat in the House of Peers. He soon displayed such splendid abilities in debate, and supported the government with so much zeal, that he was, January 20, 1718, raised to the highest rank in the English peerage. He did not take his seat in the English House of Peers until 1720. Here he opposed with much warmth the government measure on the South Sea Bill, and the bill of pains and penalties against Bishop Atterbury. His affairs became hopelessly involved by his extravagance, so that, although he had succeeded to an estate of £16,000 a year, he was soon compelled to accept a yearly allowance of £1200 from his creditors. He set up a political paper, called the *True Briton* (74 numbers, 1723–24), and lost no occasion of speaking, as well as writing, against the ministry and the court. In 1725 he set out for Vienna, and then visited Madrid, where he was served with an order from the Privy Seal to return home. He treated the order with contempt, and afterwards went to Rome, and appeared openly at the court of the Pretender, from whom he accepted the Order of the Garter. He now assumed the title of Duke of Northumberland. In 1727 he fought with the Spaniards and against his countrymen at the siege of Gibraltar. This last mad act lost him his English title and estates, and led to his conviction under a bill of indictment for high-treason. He refused to make his submission to the government; and the rest of his life was passed in France and Spain, at one moment squandering his precarious supplies of money in drunkenness and luxury, and at another suffering the extremest poverty. He died in a miserable condition at a Bernardine convent in Catalonia, May 31, 1731. His brilliant talents and wasted life were sketched by Pope in his Moral Essays, in the lines beginning, 'Wharton, the scorn and wonder of our days.'

See the *Life and Writings of Philip, late Duke of Wharton* (2 vols. 1732), and *The Poetical Works of Philip, late Duke of Wharton, and of the Duke's Intimate Acquaintance* (2 vols. 1727); and the *Life* of him by J. R. Robinson (1896).

Whately, RICHARD, Archbishop of Dublin, was born in London, 1st February 1787, the fourth son of Dr Joseph Whately of Nonsuch Park, Surrey, prebendary of Bristol, vicar of Widford, and lecturer at Gresham College. He was sent in due time to a private school at Bristol, whence in 1805 he passed to Oriel College, Oxford. He took a double second-class in 1808, gained the prize for the English essay in 1810, and the year after was elected a fellow of Oriel College. Copleston, Davison, Arnold, Keble, and Hawkins were already fellows, and Newman and Pusey were added later. In his *Apologia* Newman tells us that Whately opened his mind and taught him how to think and reason. In 1815 he became one of the college tutors, and about this time he wrote for the *Encyclopædia Metropolitana* what he afterwards expanded into his popular treatises on Logic (1826) and Rhetoric (1828). He had married in 1821, and accepted the living of Halesworth in Suffolk, and he had already given the world the first proof of his peculiar wit in *Historic Doubts relative to Napoleon Bonaparte* (1819)—an ingenious attempt to reduce to an absurdity Hume's position that no testimony is sufficient to prove a miracle. In 1822 he delivered the Bampton Lectures at Oxford, on the Use and Abuse of Party Feeling in Religion. In 1825 he was appointed Principal of St Alban's Hall, and in 1829 was appointed professor of Political Economy, but had only given a few lectures when in 1831 he was made Archbishop of Dublin.

A Liberal in religion and in politics, Whately may be counted one of the founders of the Broad Church party. Broadly rational in temper, sober and impartial, he was a resolute opponent of the Tractarian movement, but to the Evangelicals he seemed little better than a Latitudinarian, for he supported Catholic emancipation and concurrent endowment, and laboured long, but in vain, to establish a system of unsectarian religious instruction. Still worse, he was more than suspected of holding unsound views on predestination, future punishment, and the Sabbath question, and of being somewhat Sabellian on the nature and attributes of Christ. His caustic wit, abrupt manners, and fearless outspokenness brought him no little unpopularity, but the sterling honesty of his nature, his charity, justice, and sagacity gained him many friendships of unusual permanence and warmth, and conquered for him the respect of all men. One of the deepest things in his nature was a strong sense of duty, but for which indeed he would never have accepted the archbishopric, for he was within the truth when he termed the appointment 'a call to the helm of a crazy ship in a storm.' He died 8th October 1863.

Whately, though a strong logician, was devoid of the speculative faculty, hence his theological writings lack that kind of value which is the most enduring. But his acute intellect enlightened every subject that he touched, and his powers of exposition and illustration have hardly ever been surpassed. Of his books may be named *Essays on some of the Peculiarities of the Christian Religion* (1825), *Essays on some of the Difficulties in the Writings of St Paul* (1828), *Thoughts on the*

Sabbath (1830), *Christian Evidences* (1837), *Essays on some of the Dangers to Christian Faith* (1839), *The Kingdom of Christ Delineated* (1841), and his edition of Bacon's Essays, with annotations not unworthy of the text (1856), as well as Paley's *Evidences* and *Moral Philosophy*. A list of his writings is appended to the New York edition of his *General View of Christianity* (1860). See the rambling *Memoirs* by W. J. Fitzpatrick (2 vols. 1864), and the more authoritative *Life and Correspondence* by Miss E. Jane Whately (2 vols. 1866).

Whaup. See CURLEW.

Wheat, the most valuable of all the cereal grasses. The genus Triticum, of which the species are popularly known either as *Wheat* or *Wheat-grass*, is distinguished by a spike with many-flowered spikelets, without stalks, and seated one on each notch of the rachis, their sides directed to the rachis, which is zigzag; and two glumes, of which the lower is either awned or awnless; the outer palea of each floret having at the top a notch, in the centre of which is the terminal point, sometimes prolonged into an awn, or, in some species, with many florets tapering into an awn without a notch. (See the diagrams of a wheat spikelet and a wheat grain at GRASSES.) A number of species are found in Britain, of which *T. repens*, well known as Couch Grass (q.v.), is the most common; but the seeds of none of them are of any value. It is not certainly known from what wild species our cultivated wheats have been derived. The most grass-like among the cultivated wheats, 'one-grained spelt' or 'small spelt' (*T. monococcum*), is very closely allied to the wild grass *T. ægilopoides*, found in the Balkans and in western Asia. On the other hand, there is some probability that the common spelt wheats of southern Europe are derived from *T.* (*Ægilops*) *cylindricum*, which occurs wild in the Black Sea region. The Emmer type, and possibly the macaroni or hard wheats, appear to be related to *T. dicoccoides*, discovered in Palestine and Syria.

Wheat has been cultivated from the earliest ages, seems to have been cultivated in China 3000 years B.C., is found in prehistoric European lake-dwellings, and was a chief crop in ancient Egypt and Palestine, as it still is in all the temperate parts of Europe, Asia, and Africa. It is cultivated to a considerable extent in the north of India. In North America it is very extensively cultivated, and many parts of the United States and British provinces are admirably adapted to it. Wide regions of South America are equally suitable, and wheat of the finest quality is produced in Australia. In the torrid zone wheat does not succeed, except in elevated situations; but it nowhere succeeds better than in subtropical regions, although it is a hardy plant, and when covered by snow endures even very severe winters in the north of Europe. For its successful cultivation, however, it requires a mean temperature of at least 55° F. for three or four months of the year. It is an annual plant, and its capacity of enduring the cold of winter is of importance only in connection with the advantage to be derived from sowing in autumn, so as to have it more forward in spring. Its cultivation does not extend so far north as that of barley or oats, or even of rye. In Europe its northern limit is about 60° lat. The quality of the grain varies much in different soils and climates, and particular varieties are also distinguished by difference of quality as well as by external characters. The wheat of the eastern parts of Britain, where the climate is comparatively dry, is superior to that of the western parts, where the sky is more cloudy and the climate more humid, although the crops in the west are not less luxuriant.

Botanists distinguish several species and subspecies among cultivated wheats, some of which are commonly known as *spelts;* in the latter the axis of the ear is brittle and the grains are firmly enclosed in the chaff. The threshed grain of the spelts is hence enclosed in the chaff, whereas that of the ordinary wheats is naked. Of the spelts, *T. monococcum*, Small Spelt or Einkorn, is cultivated to a small extent in the mountainous regions of central Europe.—*T. dicoccum*, two-grained spelt, known as Emmer in Germany and Amidonnier in France, is also unimportant commercially.—Common Spelt (*T. spelta*), so frequently mentioned by Roman writers, is still grown to a small extent in the Mediterrannean countries and in central Europe. There are several varieties, most of which yield an excellent and very white bread flour.—Among wheats proper, the hard or macaroni type (*T. durum*) is distinguished by long and reed-like straw and flinty grain, the latter being difficult to mill, and yielding a somewhat yellow though very 'strong' flour. Macaroni wheats are very resistant to drought, and have given satisfactory results in regions of low rainfall. They are widely cultivated in northern Africa and southern Europe, and also, for example, in the semi-arid regions of the United States. From their flour, macaroni, vermicelli, and similar foods are prepared.—Polish wheat (*T. polonicum*) is a remarkable tall form with long loose ears and extremely large, flinty grain. It is probably allied to the previous type, and is cultivated in Spain and Italy; it is not grown in Poland, having received its name owing to a misapprehension about its origin.—Rivett or Cone wheat (*T. turgidum*) is a tall form with almost solid straw, the ears awned and the chaff generally hairy. Rivett wheats are grown on some of the poorer clay soils in England. They are hardy and yield well, but are late in ripening, and their flour is generally weak. They are also widely grown on the Continent.—Common wheat (*T. vulgare*) includes a great number of varieties; the grain may be red or white, and of various sizes and shapes; the ears may be lax or dense, awned or awnless, and the chaff red or white, hairy or smooth, and so forth. The grain, moreover, gives flour of greatly differing qualities. 'Strong' wheats, which are more or less horny and translucent in character, give flour which rises readily in baking, and produces a large open loaf. 'Weak' wheats have opaque, starchy endosperm, and can only be used satisfactorily for bread-making when they are blended with strong varieties. Wheats grown in dry climates are generally fairly strong, but some varieties yield strong grain under moist conditions. Most British-grown wheat is rather weak.

The red varieties of wheat are somewhat more hardy than the white; the grain is inferior in quality, and yields less flour, but with the substitution of the modern roller-mill for the old grindstones, the difference has become relatively unimportant. Red wheats are preferred for comparatively poor soils, but the white kinds are generally cultivated wherever the soil and climate are suitable. The varieties with long straw yield the best crops in dry seasons, but the short-strawed kinds are best when the season is wet. Wheat is particularly suited to clay soils and rich heavy loams; but with good farming excellent crops are produced even on light sandy or gravelly and on chalky soils. Where the climate is moist a light dry soil is most suitable; soft deep soils being productive chiefly of straw. The land intended for wheat must, at least in Britain, be in a high state of cultivation and fertility. Wheat is commonly sown after green crops, beans, or bare fallow, and often after grass or clover. It may be sown, at least in autumn or the beginning of winter, when the ground is so saturated with moisture that any other kind of grain would be almost sure to perish.

It is either sown broadcast or in drills, and the practice of drilling becomes more and more prevalent, on account both of the saving of seed and of the superiority of the crops produced. The land prepared for wheat is very often manured with farmyard manure or artificial manures.

The relative proportions of straw and grain differ very much in different varieties of wheat, and according to differences of soil, climate, and season. The proportion of the weight of grain to that of the whole plant when dried so as to be ready for stacking varies from 20 to 47 per cent. The composition of the grain itself varies considerably as to the proportions of starch, gluten, &c., which it contains. American, Australian, and Indian wheats are drier than European; British samples commonly contain 15 or 16 per cent. of moisture, American prairie wheat about 12, and that from India and the drier parts of Australia about 10. A typical analysis of the entire grain would show about 12 per cent. of protein, 2 per cent. of oil, 69 per cent. of carbohydrates (nearly all starch), 2 per cent. of crude fibre, and about 1·7 per cent. of ash, the remainder being water. The protein (gluten) of wheat consists mainly of two substances, gliadin and glutenin. The protein is most abundant in the layers immediately under the seed-coat or bran, while the oil occurs mainly in the embryo or germ. Since the seed-coat and the greater part of the embryo are separated from the flour in the usual process of milling, white flour contains substantially less protein, fibre, and oil, and proportionately more starch than the entire grain.

The value of wheat depends mainly on the quantity of fine flour which it yields; the best wheat yielding 75–78 per cent., sometimes even 80 per cent. of fine flour, whereas ordinary kinds seldom yield more than 70 per cent., and inferior only 60–65 per cent. In general the smoother and thinner the grain is in skin the greater is the produce of fine flour. The greater part of the husk of wheat is separated from the flour by the miller, and is known as *bran*. That portion of the bran which is more finely divided than the rest receives the name of *sharps* or *pollard*. See the articles BRAN, FOOD, BREAD.

Wheat being the most esteemed of all the cereals, particularly for the making of bread, the increase of its cultivation and use has marked the progress of agriculture and of wealth in many countries. It is only in comparatively recent times that bread made of wheat has become a common article of food among the labouring classes in Britain. In the 8th century the monks of the abbey of Bury St Edmunds ate barley-bread, because the income of the abbey would not admit of their using wheaten bread regularly. At a later period wheat was largely used, at least in the southern parts of England, for a short time after harvest, but the supply was soon exhausted, and recourse was again had to inferior kinds of food. From Walter of Henley's *Husbandry* (ed. by Eliz. Lamond, 1892) we learn that in the early 13th century wheat was expected to produce only five-fold (as compared with say fourteen-fold now). Down to the end of the 17th century wheaten bread was a principal article of food only among the more wealthy; and the servants in their houses were still furnished with oats, barley, and rye. In the northern parts of England, as well as in Scotland, the use of wheaten bread was comparatively rare even at the middle of the 18th century. 'So small was the quantity of wheat used in the county of Cumberland,' says Eden, in his *History of the Poor* (1797), 'that it was only a rich family that used a peck of wheat in the course of the year, and that was at Christmas. The usual treat for a stranger was a thick oat-cake (called *haver-bannock*) and butter. An old labourer of eighty-five remarks that when he was a boy he was at Carlisle market with his father, and wishing to indulge himself with a penny loaf made of wheat-flour, he searched for it for some time, but could not procure a piece of wheaten bread at any shop in the town.' At the period of the Revolution, 1689, the quantity of wheat grown in England was estimated at about 14,000,000 bushels, or about three bushels to each of the population, which was then under five millions. In 1828 about 100,000,000 bushels were produced, or about seven bushels to each of the population, then under fifteen millions. During the period 1800–19 the average price of wheat in England was 86s. 11d. per imperial quarter, the two dearest years being 1801 (119s. 6d.) and 1812 (126s. 6d.). Later the price fell greatly, especially during the last twenty years of the 19th century. The average price during the ten years ending 1901 was 27s. 3d. per quarter, the lowest being in 1894, when it was 22s. 10d. Previous to the World War the price had again risen somewhat, the average for the ten years ending 1913 being 31s. 6d. During the war the price would probably have reached as high a figure as during the Napoleonic period, but was controlled at 75s. 6d.

Owing to the fall in price the quantity of wheat grown in Great Britain has also declined. In 1925 there were 1,548,000 acres under wheat in Great Britain; this was estimated to yield 51 million bushels (or 28,280,000 cwt.), which gives only a little more than one bushel and a sixth for every inhabitant. In 1891 Great Britain had 2,307,277 acres, producing 72,127,263 bushels—over two bushels a head. In 1874 there were 3,630,300 acres under wheat in Great Britain. To supplement the home production there were imported in 1924–25, 118,680,000 cwt. of wheat and wheat meal and flour (the flour given in equivalent weight of grain), equal to 221,536,000 bushels. The wheat imported was thus equal to fully four times the amount grown at home; together they give an average of nearly six bushels to every inhabitant. In 1891 the import was 89,539,355 cwt. (167,140,129 bushels), over twice the amount grown at home; whereas in 1886 the import was 67,021,886 cwt. (125,107,520 bushels), or just double the home-grown amount. By the rapid increase of imports, the amount per head has been maintained for a greatly increased population. Of the wheat imported during the four years 1922 to 1925 inclusive, about 32 per cent. came from Canada, 30 per cent. from the United States, 16 per cent. from the Argentine Republic, 12 per cent. from Australia, 6 per cent. from India, and the balance from other countries. With prices averaging 30s. to 25s. per quarter—as they did previous to the World War—wheat could not be grown at a profit in many parts of Britain where it was formerly cultivated with success. Indeed, wheat-cultivation was persevered with only in soils and situations specially favourable to it. Through the superior systems of farming pursued, the produce of wheat per acre in Great Britain is greater than in any other country, except Belgium, Holland, and Denmark, but the cost of production is necessarily much higher than on the rich virgin soils of comparatively new countries. Wheat-cultivation spread considerably during the war years.

The Spaniards introduced wheat-culture into Mexico about 1530; wheat was first planted in New England in 1602, and in Virginia in 1611. The growth of the acreage in the United States has been phenomenal, especially since the development of the central states in the upper Mississippi valley, and again on the Pacific coast. The total wheat crop of the United States was 260,147,900

bushels in 1869–70; it increased (with fluctuations) to 945,403,215 bushels in 1919, after which it declined but was still about 856,000,000 bushels in 1926. Of the latter amount it was reckoned that about 74 per cent. would be required for home consumption. The wheat acreage of the United States in 1926 may be put at 57,000,000; the Union of Soviet Republics (Europe and Asia), 47,000,000; India, 30,000,000; Canada, 23,000,000; Argentina, 19,000,000; France, 13,500,000; Italy, 12,000,000; Australia, 11,000,000; and Great Britain, 1,645,000.

The principal diseases to which wheat is subject, some of which are productive of great loss to the farmer, are either owing to or connected with the presence of parasitic fungi. The chief of these diseases, noticed separately, are Bunt, Mildew, Rust, and Smut. Wheat is also liable to injury from several insect pests, such as Wireworms, and various other Corn Insects (q.v.). The Hessian Fly is separately discussed. *Ear-cockles* (also called 'purples' or 'peppercorn') is a disease in wheat associated with the abundant presence of a Threadworm (q.v.) parasite. This minute animal has received various names—e.g. *Vibrio tritici*, *Anguillula tritici*, but is now usually called *Tylenchus scandens*. An infested or mildewed ear of wheat contains some ten larvæ in each grain; these lie quiescent, and can so remain for many years, surviving what appears to be very thorough desiccation. If the grain be sown the larvæ become active, and migrate into the soil. Thence they return to the young wheat-plants, into which they insinuate themselves, and may there spend the winter. With the growth of the plant the threadworms ascend the stem and finally pass into the ears. There they become sexually mature, and the females deposit eggs. After that the parent forms apparently die, but the eggs develop into larvæ.

See AGRICULTURE, and books there cited; CEREALS; CULTIVATED PLANTS; GRASSES; STRAW; PLANTS (*Diseases*); Vilmorin, *Les Blés Meilleurs* (1881); *Standard Ency. of Modern Agric.* (1911); Percival, *The Wheat Plant* (1921).

Wheat-ear (*Saxicola œnanthe*), a bird of the Chat (q.v.) genus, a summer visitor to the British Islands. Although generally and widely diffused it is still a local bird in most places. It breeds throughout central and northern Europe, and in southern Europe where the mountains are high enough for pine and birch. It winters in tropical Africa and probably farther east. It nests about the middle of April, and sometimes produces two broods of from five to seven young in a season. It feeds on insects, grubs, worms, small spiders, and small snails. It is a good mimic, and the song of the male is very pleasing. As the bird leaps and twists in an unpredictable way through the air, or flits from stone to stone on the moor, it utters a characteristic *chack, chack*, and it is often called 'stonechat.' The most striking character of the plumage is the white colour of the rump, upper tail-coverts and base of the tail, whence the name *white rump*, by which the bird is known in every European language, and of an Old English equivalent of which 'wheat-ear' is believed to be a modern corruption—though it is thought by some to be for *whitterer*, meaning *twitterer*. The birds migrate at night, and in autumn when they are fat and of rich flavour they used to be snared in great numbers. The wheat-ear is also known by the names fallow-finch, white-tail, stone-chacker, chack-bird, &c. It is a very welcome sight in spring, for it is the first summer visitor to arrive in Britain, the pioneer males reaching the south coast early in March. The Isabelline Wheat-ear (*S. isabellina*) has been found only a few times in Britain. It differs from the common wheat-ear in being larger, more tawny, in having a shorter tail with more black in it, and the under wing much lighter. The Black-throated Wheat-ear (*S. stapazina*) and the Desert Wheat-ear (*S. deserti*) have been found in Britain only once or twice.

Wheat-ear (*Saxicola œnanthe*).

Wheat-fly. See CORN INSECTS, HESSIAN FLY.

Wheaton, HENRY, American jurist, was born at Providence, Rhode Island, November 27, 1785, graduated at Brown University in 1802, and three years later was admitted to the bar. From 1812 to 1815 he edited the *National Advocate* in New York, then for four years was a justice of the Marine Court there, and from 1816 to 1827 reporter for the United States Supreme Court (*Reports*, 12 vols. 1826–27; also *Digest of Decisions from 1789 to 1820*, 1820–29). In 1827–35 he was *chargé d'affaires* at Copenhagen, and in 1835–46 minister at Berlin. In 1836 he published his most important work, the *Elements of International Law*, which has seen many editions, under various editors, and been several times translated. Other works include a Life of William Pinkney, Histories of the Northmen and of the Law of Nations, &c. He died at Dorchester, Massachusetts, March 11, 1848.

Wheatstone, SIR CHARLES, scientist, electrician, and the pioneer of telegraphy, was born in the vicinity of Gloucester, in February 1802. A precocious child, he could read at four years of age, and at the private school which he afterwards attended he showed a strong liking for mathematics and physics. In 1806 his father, who was a musical instrument maker, removed to London, and began business. In 1816 young Wheatstone was placed with his uncle, a music-seller, but his father removed him when he saw that he was more inclined for study. Endowed with remarkable ingenuity, he produced numerous models and apparatus to illustrate the phenomena of acoustics and light, and also exhibited some clever musical instruments. For a period of six years (1823–29) Wheatstone was back at the music-selling business. A paper of his on *New Experiments in Sound* was translated into French and German, and previous to 1833 he had published five papers connected with this subject. In 1831 he read a paper on *Transmission of Sound through Solids* before the Royal Institution, and henceforward he became known as an earnest and hard-working man of science. Although he could describe and explain his inventions clearly enough, he was shy and sensitive, and failed as a lecturer, many of his investigations being made known by Faraday at the Royal Institution.

In 1834 he was appointed professor of Experimental Philosophy at King's College. He invented a rotating mirror, by means of which he determined the time the electric impulse took to travel along a

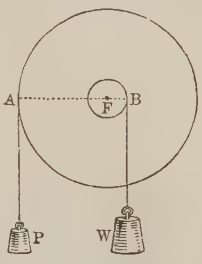
¼ mile of copper wire. His future studies were now in the line of sound and electricity. In 1835 he made a speaking-machine with an india-rubber mouth, which uttered such simple words as 'rum,' 'mamma,' &c. Wheatstone and W. F. Cooke in 1837 took out a patent 'for improvements in giving signals and sounding alarums in distant places by means of electric currents transmitted through metallic circuits.' From this instrument, which had five needles, has grown that system of electric telegraphs which now ramifies over the length and breadth of the United Kingdom. Between 1836–40 his mind was also occupied with the problem of submarine telegraphy (see TELEGRAPH).

In a paper on Binocular Vision laid before the Royal Society in 1838 he explained the principle of the Stereoscope (q.v.), an instrument of his invention; in 1840 he showed that, by means of electro-magnetism, a number of clocks far apart might be kept going with absolute exactitude from one central clock (see ELECTRIC CLOCKS); and in 1843 he brought out his new instruments and processes for determining the constants of a voltaic series. Wheatstone was unrivalled in reading secret cipher; and his own cryptograph is said never to have been deciphered. There were also his automatic telegraph in two forms; his telegraph thermometer and barometer; a machine for the conversion of dynamical into electrical force without the use of permanent magnets; and an apparatus for conveying instructions to engineers and steersmen on board large steam-vessels. The method of measuring electrical resistance known as Wheatstone's Bridge (brought into notice, though not invented by him) is explained at ELECTRICITY, Vol. IV. p. 266. Nor should we omit to mention his Concertina (q.v.) and polar clock. He was a vice-president of the Royal Society, and received its royal medal in 1840 and 1843, and the Copley medal in 1868. He was knighted in 1868, was made LL.D. of Edinburgh in 1869, and died at Paris, October 19, 1875.

Most of Wheatstone's investigations are described in *Philosophical Transactions*, *Proceedings of the Royal Society*, and British Association *Reports*. His *Scientific Papers* (1879) are among the publications of the Physical Society, London. See *Proc. Inst. C. E.* (xlvii.), and *Proc. Roy. Soc.* (xxiv. 47).

Wheel, BREAKING ON THE, a very barbarous mode of inflicting the punishment of death, formerly in use in France and Germany, where the criminal was placed on a wheel, with his arms and legs extended along the spokes, and the wheel being turned round, the executioner fractured his limbs by successive blows with an iron bar, which were repeated till death ensued. There was considerable variety in the mode in which this punishment was inflicted, at different times and in different places. By way of terminating sooner the sufferings of the victim, the executioner was sometimes permitted to deal two or three severe blows on the chest or stomach, known as *coups de grâce;* and occasionally, in France at least, the sentence contained a provision that the criminal was to be strangled after the first or second blow. Mercy of this kind was, however, not always allowed to be shown to the victims of the wheel: when Patkul, the envoy of Peter the Great, was put to death on the wheel by order of Charles XII. of Sweden, it is said that the officer in command of the guard was cashiered by the Swedish king in consequence of having allowed the head to be struck off before life was extinct in the mangled limbs. The punishment of the wheel was abolished in France at the Revolution—Jean Calas (q.v.) had suffered by this means; in Germany it was inflicted within the 19th century on persons convicted of treason and parricide. The murderer at the wife's instigation of John Kincaid of Warriston was broken on the *row* or wheel at Edinburgh in 1604, as also two of the slayers of the Regent Lennox.

Wheel and Axle is a modification of the Lever (q.v.). Its most primitive form is a cylindrical axle, on which a wheel, concentric with the axle, is firmly fastened. When it is employed for raising heavy weights, the weight is attached to a rope which is wound round the axle, and the power is applied either to a rope wound round the grooved rim of the wheel, or to a handle fixed at right angles to the wheel's rim, or to its practical equivalent, an ordinary winch. The accompanying figure exhibits a transverse section of one of the commoner forms, and shows that the machine is neither more nor less than a lever, whose extremities are the points at which the power and weight act. These do not act at *invariable* points in the circumferences of the circles whose radii are FA and FB. They act along the cords wound round the circles and therefore at the points A and B at which *for the moment* the cords are tangents to the circles. Thus the imaginary simple lever, AB, is preserved unaltered in position and magnitude. The conditions of equilibrium are that $P \times AF = W \times FB$, or, since the circumferences of circles are proportional to their radii, that P : W :: circumference of axle : circumference of wheel. The *capstan* and *windlass* are simple and common examples of this mechanical power, and combinations of toothed-wheels, or of wheels from one to another of which motion is communicated by an endless band, are compound illustrations of the same.—For water-wheels, see WATER (section on Water-power); for the potter's wheel, see POTTERY.



Wheel-animalcule. See ROTIFERA.

Wheeling, the principal city of West Virginia, a port of entry, and capital of Ohio county, on the left bank of the Ohio River, and at the mouth of Wheeling Creek, at the foot of steep hills, 60 miles (92 by river) SW. of Pittsburgh. The National Road here crosses the Ohio, over which is a wire suspension bridge, with a span of 1010 feet; and a fine railway bridge connects the city with Bellaire, Ohio. For ten years (1875–85) Wheeling was the state capital. It contains a fine court-house and a custom-house. The hills around the city are full of bituminous coal. The principal manufactories are blast-furnaces, foundries and forges, nail-factories, glass-works, woollen, flour, and paper mills, &c. Pop. (1880) 30,737; (1900) 38,878; (1920) 56,208.

Wheel-lock. See FIREARMS, Vol. IV. p. 667.

Whelk, a popular name for a number of marine Gasteropods, especially applied to species of Buccinum common on the coasts of northern seas. Very familiar is *Buccinum undatum*, the 'common whelk.' It occurs from low water to a depth of about 140 fathoms, and burrows in the sand for bivalves, such as Mya, on which it feeds. Its shell is sometimes 3 inches in length, is grayish or brownish-white in colour, and has a few ridged whorls, a wide aperture, and a short notch or canal for the respiratory siphon. The animal has a strong radula with which it can bore through shells, a markedly protrusible mouth, a long protrusible siphon through which water enters the gill-chamber, and a plate-like horny operculum borne by the foot. The notch at the mouth of the shell, in which the

siphon lies, is characteristic of most carnivorous Gasteropods. The egg-capsules, which are aggregated in balls, are often seen attached to the rocks or drifted on to the sand. Each capsule contains a large number of eggs, but only a few of the embryos survive, as the result, it is said, of juvenile cannibalism. In Scotland *Buccinum undatum* is often called the Buckie, but the 'roaring buckie' is *Fusus antiquus*, a related form, which has a much longer siphon canal. The name 'dog-whelk,' or 'dog-periwinkle,' is given to *Purpura lapillus*, a small form very common among the rocks and very destructive to mussel-beds. It secretes a white fluid, which on exposure to air becomes a brilliant blue. Its egg-capsules are also common on the rocks, and look like little vases standing erect in clusters. Another common 'dog-whelk' is *Nassa reticulata*, abundant on the low-water rocks.

Common Whelk (*Buccinum undatum*).

All these must be distinguished from the most edible whelk—the Periwinkle (*Littorina littorea*), a vegetarian Gasteropod not nearly related to the above. For anatomy, see GASTEROPODA.—*Whelk* is also an old name for Acne (q.v.).

Whetstones, or HONES, are used for sharpening cutting instruments of all kinds. For scythe and other large steel blades stones of a coarse texture or grain are used, but for putting a fine edge on chisels, razors, penknives, and engravers' tools fine-grained hones are employed. There are few known localities for such as have suitable fineness, hardness, uniformity of texture, and 'bite' combined in such a way as to form a first-rate hone. The three most favourably known are the *Turkish hone or oil-stone* from Asia Minor, composed of about 73 per cent. of silica intimately mixed with calcite; the *Arkansas hone*, consisting of 98 per cent. of silica; and the *German razor hone*, from near Ratisbon. The *Washita hone*, found in the same state and county, is cheaper and better suited for ordinary tools than the Arkansas stone. In Great Britain the best *hone slates*, as they are sometimes termed, are the *Charnley Forest stone* (Leicestershire); the *Welsh oil-stone*, or *Idwal stone;* the *cutler's greenstone*, also a Welsh rock; and the *Water-of-Ayr stone*. This last, a fine-grained argillaceous rock, rather softer than most hone-stones, is used for numerous other purposes besides sharpening tools. Several kinds of hone-stones are used for polishing hard surfaces—that of silver, for instance. The rocks used for making whetstones are either sedimentary or metamorphic in character, and include sandstone, quartzite, slate, and mica-schist. The *novaculites* of Arkansas, which are in great demand as high-grade oil-stones for sharpening small tools, are very fine-grained chert-like sandstones. There are instances of 'whetstones' made of wood with the pores filled up with some hard substance.

Whewell, WILLIAM, D.D., was born on 24th May 1794 at Lancaster. His father intended him for his own trade—that of a joiner; but the boy having excelled at school in mathematics, went up in 1812 to Cambridge as an exhibitioner of Trinity College, and, after gaining the Chancellor's medal for the English prize poem in 1814, graduated in 1816 as second wrangler and second Smith's prizeman. He became a fellow and tutor of Trinity, where also for many years he acted as a successful 'coach,' or private tutor; in 1820 was elected an F.R.S.; between 1828 and 1832 was professor of Mineralogy in Cambridge, and between 1838 and 1855 professor of Moral Theology. In 1841 he succeeded Dr Wordsworth as Master of Trinity, and in the same year was President of the British Association at its meeting at Plymouth. He was also for a time President of the Geological Society. In 1855 he became Vice-chancellor of the university of Cambridge. He died at Trinity on 6th March 1866—the result of a fall from his horse. A large, strong, erect man, with a red face and a loud voice, Whewell was an effective preacher and lecturer, though in both characters wanting in that something which wins and rivets the hearer. He was accused of being arrogant; and one remembers the well-known Chinese music story, and Sydney Smith's saying, 'Science is his forte and omniscience his foible.' His knowledge was indeed encyclopædic, with all the defects of an encyclopædia; his works included *Astronomy and General Physics considered in Reference to Natural Theology* (Bridgewater Treatise, 1833), *History of the Inductive Sciences* (3 vols. 1837), *The Philosophy of the Inductive Sciences* (2 vols. 1840), *The Elements of Morality, including Polity* (1855), *The Plurality of Worlds* (1853), and other writings on the tides, electricity, magnetism, heat, German church architecture, the History of Moral Philosophy in England, &c., besides translations of Goethe's *Hermann and Dorothea*, Auerbach's *Professor's Wife*, Grotius' *Rights of Peace and War*, and Plato.

See Todhunter's *Whewell* (1876), the Life by Mrs Douglas (1881), and Clark's *Old Cambridge Friends* (1900).

Whey. See MILK.

Whichcote, BENJAMIN, one of the Cambridge Platonists, was born of a good Shropshire family, March 11, 1609, entered Emanuel College, Cambridge, in 1626, and became a fellow in 1633. For ten years a college tutor, in 1643 he took the college living of North Cadbury in Somersetshire, afterwards held by Cudworth, but a year later became Provost of King's College, Cambridge, in the room of the ejected Dr Collins. Yet he was far from being a Puritan, and he protected the interest of the provost and fellows with the most scrupulous care. And his influence upon the university was great. Already as a fellow he had been the tutor of Wallis, Culvervel, and John Smith, who says of his master, 'I lived upon him.' At the Restoration he lost his provostship, but held livings first at St Anne's, Blackfriars, together with Milton in Cambridgeshire, and finally the vicarage of St Lawrence Jewry, where he died in May 1683. He himself published nothing; and four volumes of *Discourses* (i.–iii., edited by Dr Jeffery, 1701; iv., by Dr Samuel Clarke, 1707), and *Moral and Religious Aphorisms*, collected from his MSS. by Jeffery (1703; new ed. by Dr Salter, containing his correspondence with Dr Tuckney, 1753), notable for vigour and point, are all his work. Whichcote's personality was greater than his intellectual productiveness, and his real significance must be sought in the impulse he gave to philosophical theology as seen in his own pupils and contemporaries—in Smith, More, and Cudworth, as well as Tillotson, Patrick, and Burnet.

See Principal Tulloch's *Rational Theology* (vol. ii. 1872), Bishop Westcott's *Essays in the History of Religious*

Thought (1891), vol. iii. of Bass Mullinger's *History of the University of Cambridge* (1892), and F. J. Powicke, *The Cambridge Platonists* (1926). The Earl of Shaftesbury edited a selection of his sermons in 1698, which was reprinted at Edinburgh by Principal Wishart in 1742. E. T. Campagnac, *The Cambridge Platonists* (1901), gives selections with notes. The best edition of his complete works is by Drs Campbell and Gerard (4 vols. Aberdeen, 1751).

Whidah. See DAHOMEY.

Whig, a shortened form of *whiggamor*, a nickname of the peasantry of the Western Lowlands of Scotland, derived not from *whig*, 'sour whey,' but from *whiggam*, a sound used by them in driving their horses. The 'Whigamore Raid' is the name given to the march of 7000 western Covenanters on Edinburgh (1648), which sealed Charles I.'s doom; and we find the same term applied to the Covenanters of Bothwell Bridge (1679). Thence the name Whig came to be fastened first on all the Presbyterian zealots of Scotland, and afterwards on those English politicians who showed a disposition to oppose the court, and treat Protestant nonconformists with leniency. Coming into use about 1679–80, Whig and Tory (q.v.) became familiar words, and were retained as designations of the two opposite political parties, renamed since 1830 Liberals and Conservatives, Whig being restricted to the more conservative members of the Liberal party, as opposed to Radical (q.v.). See Hobhouse's *Liberalism* (1911).

In United States history it denotes those who in the colonial and revolutionary periods were opposed to the British rule; and also it is the name adopted in 1834 by the survivors of the old National Republican party, after its overwhelming defeat by Jackson in 1832. Jackson's bold action in dismissing members of his cabinet, and his relentless war upon the United States Bank, made him in their eyes a tyrant little less hateful than George III., and the old name of Whig was chosen as expressive of their revolt against one-man power. Webster, Clay, and other National Republicans and old Federalists readily accepted the name, under which they were defeated in 1836, and in 1840 won their first great victory in the return of President Harrison. The party died in 1852, slain by the hands of its own dissatisfied members.

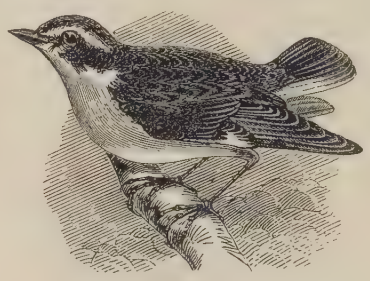
Whimbrel (*Numenius phæopus*), also called Titterel, in the same genus as the Curlew (q.v.). But it is much smaller (about 17 inches long) and has different markings. It winters in African and

Whimbrel (*Numenius phæopus*).

Indian regions, and nests far to the north, including the Orkneys, the Shetlands, and Scandinavia. Migrants going north reach Britain in April and May, and some non-breeders pass the summer on British coasts.

Whin. See GORSE.

Whin-chat (*Pratincola rubetra*), one of the 'Bush-chats,' in the same genus as the Stone-chat (q.v.), a summer visitor breeding in Britain, frequenting heaths and pastures, whence its name 'Grass-chat.' It is a valuable insect-eater, devouring wireworms, for instance. It makes a loose nest



Whin-chat (*Pratincola rubetra*).

of dry grass and moss on the ground, and lays about six greenish-blue eggs with rusty marks. There are usually two broods in the season. A simple pleasant song is uttered on the wing or from a low branch. It winters in African and Indian regions.

Whinstone, a popular northern name for basaltic or other hard and compact kind of stone.

Whippet, a popular racing and rabbit-coursing dog, produced by crossing the Italian greyhound with a terrier. It is very like the Italian greyhound in appearance and size, and is of various colours—black, white, fawn, or brindled. See GREYHOUND.

Whipping. See FLOGGING, KNOUT. Of innumerable kinds of whips—coach-whips, horse-whips, dog-whips, &c.—the types vary from a slender pliant switch all in one piece to a short stiff handled whip with a very long lash. The stock-whip of Australia, a riding whip, has a short handle of 2 feet, with a lash 15 feet. The wagon-whip of South Africa comprises a long, tapering bamboo of 14 or 15 feet, and a lash about as long; it is a two-handed whip, wielded usually by a man on foot.

Whip-poor-will (*Caprimulgus* or *Antrostomus vociferus*), a species of Goatsucker (q.v.), a native of North America, common in the eastern parts of the United States, and often imagined to be identical with another goatsucker, the Nighthawk (*Chordeiles popetue*). It receives its popular name from the fancied resemblance of its notes to the words *Whip poor Will*. It is about 10 inches long, the plumage very like that of the European goatsucker, much mottled and indistinctly marked with small transverse bands, the top of the head streaked with black, a narrow white collar on the throat. The bristles at the base of the bill are very stiff, and more than an inch long, and the tail is rounded, the lateral feathers largely white in the male. This bird is seldom seen during the day, but seeks its food by night, catching moths, beetles, and other insects on the wing. Its flight is near the ground, zigzag, and noiseless. Its notes are heard only during the night, and are clear and loud, so that when a few of these birds are close at hand the noise is such that those unaccustomed to it cannot sleep. In the more southern parts of the United States the whip-poor-will is replaced by a larger species, the Chuck-Will's-widow (*C.* or *A. carolinensis*), and which, like the whip-poor-will, takes its name from its cry, and to the west

by a smaller one (*C.* or *A. Nuttalli*) having a somewhat similar cry to the whip-poor-will, but feebler. See Baird, Brewer, and Ridgeway's *North American Birds* (Boston, 1874).

Whip-snake, a name given in North America to various species of the genus Masticophis (especially *M. flagelliformis*, the coach-whip snake, 4 to 5 feet long, slender, and harmless); as also to species of Philodryas, of Passerita, &c.

Whirlpool, a circular current in a river or sea, produced by opposing tides, winds, or currents. It is a phenomenon of rare occurrence on a large scale, but illustrations in miniature may be noticed in the eddies formed in a river by means of obstacles or deflections. The two celebrated sea-whirlpools Charybdis (see SCYLLA) and Maelström (q.v.) are now known to be merely 'chopping seas,' caused by the wind acting obliquely on a rapid current setting steadily in one direction while the tide is flowing, and in the opposite direction when it is ebbing. During calm weather neither of these so-called whirlpools is dangerous for large ships, but when the current and the wind are strongly in opposition the broken swell is so violent and extensive in the Maelström as to founder large ships, or drive them against the rocks. Though in neither of these two cases, formerly so much dreaded, is there any vortical action, instances of such action do actually occur in various localities, as in the whirlpool of Corrievrekin (q.v.), and in some eddies produced by opposing winds and currents among the Orkney Islands.

Whirlwinds and Waterspouts. See STORMS.

Whisky (a modern refinement of the Gaelic word *usquebaugh*, 'water of life') in a general way may be defined as an alcoholic potable spirit distilled from the fermented infusion of malted or unmalted cereals. As a spirituous beverage in popular and almost universal use it has undergone the metamorphosis common to most articles of commerce which are dependent upon public taste and fashion. So much has this been the case of recent years that a Royal Commission (1908–1909) and other judicial bodies have tried to pronounce a final dictum on the vexed question—What is whisky? But their pronouncements have been ineffective, and have failed to withstand the test of time. As a result, many other forms of spirits are now being marketed under the title of whisky, much to the detriment and loss of those traders who adhere to the proper and original method of production. Scotland, and in a much lesser degree, Ireland, have for long been the chief centres of the whisky-distilling industry; and while other countries, such as Canada, Australia, and Germany, produce a spirit to which they attach the name of whisky, it is the product of Scotland which has gained such a world-wide acceptance as a beverage and stimulant. The United States of America, which used to manufacture very large quantities of whisky from rye and corn, closed down all distilleries and prohibited the sale and consumption of spirits under the operation of the Volstead Law (1917).

The history of whisky-making in Britain goes back for some centuries, but, prior to the institution of the spirit duties in the reign of Queen Elizabeth, the manufacture of whisky was confined to private stills of an archaic and primitive kind. The spirit produced was of a fiery nature, and, being crude, raw, and immature, and sold at a low price, led to widespread inebriety amongst the people of those days. Various state and municipal laws were enacted for the purpose of regulating and controlling the production of these stills, but many of these laws proved abortive and unworkable. The evasion of duty was deliberate and systematic, and smuggling abounded in all parts of the kingdom. Indeed, it may be said that only with the drastic excise laws promulgated by Walpole and the institution of bonded warehouses (1733) did any semblance of order arise out of this chaos. Gradually the system of supervision was tightened up, and to-day our customs and excise service is, without question, the finest in the world. The rates of spirit duties in Scotland, England, and Ireland varied widely in incidence up to 1861, in which year they were unified on the basis of 10s. per proof gallon. There has been a steady rise in the rate of duty ever since, and in 1927 it had reached the unprecedented figure of 72s. 6d. per proof gallon, which is about twenty times the cost of production. Duty is levied on the alcoholic strength of the spirit, and an arbitrary standard known as 'proof' has been adopted for this purpose. The strength is ascertained by means of an instrument known as the hydrometer, which floats in the spirit and determines its specific gravity. The following are the rates of duty per proof gallon since date of unification: 1861, 10s.; 1885 (May), 12s.; 1885 (June), 10s.; 1890, 10s. 6d.; 1894, 11s.; 1895, 10s. 6d.; 1900, 11s.; 1909, 14s. 9d., 1918, 30s.; 1919, 50s.; 1920, 72s. 6d. The present corresponding rates of duty on Scotch whisky imported by British Dominions are as follows: Canada, 41s. 3d.; Australia, 35s.; New Zealand, 36s.; Union of South Africa, 45s.; India, 32s. 9d. There are two classes of whisky made in this country: (*a*) malt whisky (chiefly from malted barley by the pot-still process); (*b*) grain whisky (from various unmalted cereals by the patent-still process). The popular taste now demands a mixture of those two kinds, and this has called into being the great art of blending, which is now such an important factor in the whisky trade. At present there are about 130 malt and grain distilleries in operation in Great Britain and Northern Ireland, and as the product of each distillery has its own characteristic flavour and aroma, the blender's skill is put to the test in combining the spirits from each still in such proportions as will result in a whisky of elegant taste and bouquet. The chief area for the production of malt whisky is that part of the Scottish Highlands drained by the river Spey, while the grain distilleries are situated mainly in the central area of Scotland. Pure and plentiful water is the first pre-requisite of an efficient distillery, and as the water of the Scottish Highlands is soft, limpid, and abundant in quantity, the resultant distillates from these parts are in great demand for blending purposes. The maturing of whisky is of prime importance. Notwithstanding many attempts at artificial maturation, nothing so far has supplanted the action of time in ageing and mellowing spirits. Casks which had previously contained sherry are chiefly used for the storage of the finest class of malt whisky, as the crust left in the interior of these wine casks has been proved to have a beneficial effect upon the flavour of the whisky. An important law, known as the 'Immature Spirits (Restriction) Act,' was enacted in Britain in the year 1915, whereby no spirits can be cleared from bond for consumption in this country unless they have been stored in wood for not less than three years. Similar laws have been enacted in other countries, with varying periods of detention. In actual practice the great whisky firms usually mature their spirits from seven to eight years before putting them upon the market. A serious diminution in the bulk of the spirit arises from natural evaporation through the porous timber of the oak casks. At 31st December 1926 the quantity of British spirits held in the bonded warehouses of this country was about 150,000,000

proof gallons, while in an average year the quantity of spirits distilled in Britain and Northern Ireland is about 35,000,000 proof gallons. The spirit duties provide a very large proportion of the state revenue of this country. In the year 1926 it is reckoned that the amount of duty collected from British-made spirits alone was about £38,000,000. For some years past the consumption of whisky in this country has been steadily falling, due doubtless to the very high rate of duty, which makes the selling-price prohibitive. In 1913 a bottle (reputed quart) of a good proprietary brand of Scotch whisky could be obtained at 3s. 6d., and to-day the same class of whisky costs 12s. 6d. per bottle. From time to time efforts have been made to prescribe a standard of whisky quality by means of a quantitative analysis, but these have not been attended by any measure of success. The human palate seems to set up an elusive standard of its own which defies expression in any scientific formula. The exportation of whisky to British Dominions and foreign countries is now a very important trade. In the year 1926 the quantity exported was about 6,500,000 proof gallons. Whisky when made is a perfectly clear and colourless liquid, and when it comes off the still is about 30° over proof. It is the usual practice in the distilling trade to dilute the spirits down to about 11° over proof before storing in bond. When matured in sherry casks the whisky takes on a pale straw colour, which can be still further deepened by the addition of caramel colouring to suit the varying tastes of the diverse markets to which it is shipped.

The process of manufacture at a typical malt distillery in the Highlands of Scotland may briefly be described as follows. The requisite supply of the finest barley is procured from the surrounding districts after the harvest has been gathered in. It is cleaned by screening, and is then thrown into tanks called steeps and soaked in water for sixty hours. The water is then run off, and the moistened barley is spread out on the floors of the malt barns, where it lies for ten or twelve days, being constantly turned over by the maltmen, who use wooden shovels. The grain germinates and undergoes a chemical change, the starchy matter being converted into sugar by the action of diastase, which is formed during the process of malting. The barley is then known as malt, and is now conveyed to a kiln, where it is dried over a peat fire, stopping the growth and making the grain hard, brittle, and friable. The dry malt is then ground into grist and put into a mash-tun, and infused with water at a temperature of 140° to 150° F. The liquor so obtained (worts) is a solution of maltose and dextrine, with a sweet taste. This is cooled to 70° F. by passing over refrigerators and then conveyed in pipes to the wash-backs, where yeast is added and a strong fermentation sets in. The sugar is decomposed and alcohol and carbonic acid gas are formed. The liquid at this stage is called wash, and its specific gravity is rather less than that of water. The wash is then run into the first or wash-still, where at a temperature of 180° F. the spirit, in form of vapour, rises to the head of the still and passes through spiral pipes (worm), being gradually condensed by coolers as it flows along to the low-wines receiver. This is the first distillate, known as low-wines, but it is still too impure for use. It is then conveyed to the second or low-wines still, where the process of distillation is repeated, and the resultant distillate is conveyed to the spirit receiver, whence it is racked into casks and removed to warehouse for maturing. The chief by-products are: (*a*) The refuse of the grain, known as draff, used in both a wet and dry condition for feeding cattle; (*b*) the pot ale (or burnt ale), being the liquid remaining in the wash-still after the first distillation; and (*c*) the spent lees, the residue left in the low-wines still after the second distillation. The latter two are of no commercial value.

The manufacture of grain whisky by means of the so-called patent-still differs from the pot-still process mainly in the materials used in the mash and in the method of distillation. The mash consists largely of maize, rye, and other unmalted cereals, together with a small proportion of malted grain and other saccharifierous material to ensure good fermentation. The patent-still (usually of the type invented by Æneas Coffey in 1831, or some modification thereof) deals more economically with large volumes of wash, produces a more highly concentrated alcohol, and almost entirely eliminates those secondary and volatile essences which, in the case of the pot-still process, pass over in the final distillate, and give it its characteristic aroma and flavour. The pot-still is a discontinuous process, each distillation being kept separate, and involving a period of five to six days from time of mashing to the final production of spirits; the patent-still, on the other hand, is a continuous process, a constant supply of wash being led into the still from the wash-charger.

The pollution of neighbouring streams by the effluents from distilleries has always been a serious question, but the distillers are now tackling this problem in earnest, and hopes are entertained that a complete remedy will ultimately be found.

The steady rise in the rate of duty has correspondingly increased the temptation to manufacture whisky by illegal methods. While the smuggling of 'poteen' in certain of the wilder and remoter parts of Ireland has been chronic and notorious for over a century (in the year 1913 there were 1027 seizures by the Royal Irish Constabulary), the illicit distillation of whisky in Scotland and England had almost reached a vanishing point before the Great War. The high rate of duty now prevailing has led to a certain recrudescence of secret manufacture of whisky both in Scotland and England; and while a few of these illicit stills may continue undetected for a time, most of them are ultimately discovered, the delinquents heavily punished, and the plant and material confiscated to the state.

Whisky Insurrection, the somewhat extravagant title for an outbreak which occurred in Western Pennsylvania in the summer of 1794. It arose from discontent with the excise regulations, and culminated in open riot and the destruction of private property; but by the efforts of leading citizens the rising was quelled without the aid of the 15,000 troops which Washington promptly sent against the insurgents.

Whist, a game at cards, believed to be of English origin; probably a development of the game of *trump* (or *triumph*), which was played in England at least as early as the time of Henry VIII. Trump is mentioned in a sermon delivered by Latimer on the Sunday before Christmas 1529. The game of trump is also mentioned by Shakespeare punning on the word triumph in *Antony and Cleopatra*, act iv. scene 12.

The earliest mention of *whist* (or *whisk*) is in the poems of Taylor the Water-poet (1621). In the first edition of Cotton's *Compleat Gamester* (1674) whist is described as a game 'commonly known in England.' Cotton says that 'the game of whist is so called from the silence that is to be observed in the play'; this derivation was adopted by Dr Johnson, to the extent of explaining whist to be a game requiring silence. Edmond Hoyle (q.v.), the first writer of any celebrity on whist (commonly called the father of the game), published his *Short*

Treatise in 1742. He used to give lessons in whist at a guinea a lesson.

Whist was formerly played nine-up. The change to ten-up took place about the first quarter of the 18th century. Whist played ten-up is called *long whist*. About 1785 the experiment of dividing the game into half was tried, and *short whist* was the result. The short game soon came into favour; and in 1864 the supremacy of short whist was acknowledged by the adoption as the standard of the laws of short whist framed by committees of the Turf and Portland clubs. At the end of the 19th century whist was partly superseded by bridge, which in its turn was superseded in the 20th century by auction bridge (see BRIDGE), but both varieties of bridge retain many of the fundamental principles of whist.

The game of whist is played by four persons, two being partners against the other two. The partners sit opposite to each other. The partnership is determined by cutting. The two lowest are partners against the two highest, and the lowest has the deal and the choice of seats and cards. In cutting, the ace is lowest. Each player has a right to shuffle the pack once before each deal, the dealer having the privilege of a final shuffle. The shuffling being concluded, the player to the dealer's right cuts the pack. The dealer, having reunited the packets, is bound to deal the cards one at a time to the players in rotation, beginning with the player to his left. He turns up the bottom card (called the trump card). The deal being completed, the players sort their cards, and the player to the dealer's left (or leader) plays a card face upwards on the table. The other players follow in rotation, being bound to follow suit if they can. When all have played, the trick is complete. It is then gathered and turned over by the winning side. The highest card wins the trick. The ace is highest in playing; and the other cards reckon in the order king, queen, knave, ten, &c., down to the deuce, or two, which is lowest. If any player cannot follow suit (i.e. has none of the suit led), he may play any card he pleases. If he plays a card of the suit turned up (called trumps), he wins the trick, unless another player also, having none of the suit led, plays a higher trump. The player who wins the trick becomes the leader for the next trick, and so on till the whole hand (consisting of thirteen tricks) is played out.

After scoring, the player to the last dealer's left deals in his turn; and in subsequent deals each player deals in turn, the rotation going to the left.

Scoring.—The side winning more than six tricks reckons one for each trick above six; and the side holding, either separately or conjointly, more than two of the following cards, ace, king, queen, and knave of trumps (called honours), reckons as under: If they hold any three honours, they score two; if they hold four honours, they score four. Players who are at four cannot score honours. The side first reaching five, in one hand or in a succession of hands, scores a game, valued thus: a single, if the adversaries have already scored three or four; a double, if they have scored one or two; a treble, if they have scored nothing.

A rubber consists of the best two games out of three. If the same players win two consecutive games, the third is not played. The winners of the rubber score in points the value of the games they have won; when the rubber has consisted of three games, the value of the loser's game is deducted. And whether two or three games are played, two points are added for the rubber. Thus, if A B (partners) win a single and a double, they win three points on the games, and they add two for the rubber, making five points. Had A B won the same, but Y Z (their opponents) won a treble, they would have to deduct three points, the value of the opponents' game, and would win only two points.

Whist is a mixed game of chance and skill. The chance resides in having trumps and other good cards dealt. The skill consists in the application of such knowledge as shall, in the long run, turn the chances of the cards in the player's favour. At the commencement of the hand, the first lead presents a problem of almost pure chance; but as the hand proceeds observation of the fall of the cards, inference therefrom, memory and judgment come in, so that the end of a hand often presents a problem of pure skill. It is these ever-varying gradations of skill and chance that give the game its chief interest as a scientific pastime.

To become a skilful player it is necessary to bear in mind that the game is not one of any given player's hand against the other three, but a combination of two against two. In order that two partners shall play their hands to the best advantage, they must strive, as much as possible, to play the two hands as though they were one. To this end it is advisable that they should pursue some uniform system of play, so that each partner shall understand the plans of the other, and be placed in the most favourable position to assist him in carrying them out. Experience has developed a system of play tending to this result.

1. The first, or *original*, lead should be from the player's strongest suit. A strong suit is one that contains either a large number of cards (four or more) or several high cards. The suit containing the largest number of cards (numerical strength) is the one to be mostly preferred. The object aimed at in opening the strongest suit is to exhaust the cards of that suit from the other hands. When this object is accomplished, the cards of the suit which remain in the leader's hand (called long cards) obtain a value which does not intrinsically belong to them. They often become of great service, for when led they either compel the adversary to trump or they make tricks. And when trumps are all out the player who has the lead makes as many tricks as he has long cards. On the other side, by opening weak suits there is considerable risk of sacrificing partner's strength, and of leaving long cards with the opponents.

2. Some players are prone to lead single cards, but experience shows that weak leads, as a rule, do more harm than good. Sometimes a trick or two is made by playing a trumping game; but the chances are that such tactics sacrifice partner's hand, and clear the suit for the adversaries.

3. The leader should open with the lowest card of his strong suit, in expectation that the third hand will play his highest, and so assist in clearing the leader's strong suit. Moreover, if the leader keeps the best cards of his suit in his own hand, he has a fair chance of getting the lead again when his suit is nearly or quite established. But with ace and four or more small ones it is advisable to begin with the ace, lest the ace be trumped on the second round. Also, with a high sequence in the strong suit it is best to lead one of the sequence first, lest the adversaries win with a very small card.

4. For the ordinary leads from high sequences any elementary work on whist may be consulted. For refinements on the American system of leading, and also for the cases in which the fourth-best card should be led in preference to the lowest, the more advanced treatises of 'Cavendish' may be referred to.

5. After the first trick the lead may remain with the first leader. His best play, as a rule, is to continue his suit. If the lead falls to another player, his play will be, in most cases, to open his best suit; and so on. If the lead falls to the first player's partner, he has choice of two modes of

play. If he has a very strong suit of his own, he would often be right to open it; if not, he would generally do well to continue the suit his partner first led, or, as it is commonly called, to return his partner's suit. The object is to strengthen partner by assisting to clear his strong suit.

6. When returning a suit, if the player has only two cards of it remaining in his hand, he should return the highest; if more than two, the lowest. The exception is, if he has the winning card, he should return that irrespective of the number of cards in the suit. The reason is that with but two cards of the suit remaining the player is weak in the suit, and he is therefore bound to sacrifice his good card to support his partner. But with three or more remaining after the first round he is strong, and is therefore justified in calling on partner to support him.

7. This rule of play is most important. It should be carefully observed with even the smallest cards, as it enables partner to determine the situation of the remaining cards. For example: A leads a suit in which B (his partner) holds ace, three, and two. In returning A's suit, after winning with the ace, B is bound to return the three, and not the two. When B's two falls in the third round A will know that his partner has no more of the suit. But suppose B's cards to be ace, four, three and two. In returning the suit B is bound to choose the two. Then after the third round A will conclude with certainty that B has at least one more card of the suit.

8. Late in a hand the considerations with regard to the lead vary. If there is no indication to the contrary, it is best for each side to continue the suits originally opened by them. But the fall of the cards may show that it is disadvantageous to persevere in the suits first led. In such cases the player must have recourse to other and weaker suits. The general rule to be observed here is to choose a suit in which there is reason to infer that the right-hand adversary is weak, or—but this is less favourable—one in which the left-hand adversary is strong. In either case, if the suit chosen contains but three cards, none higher than knave, or only two cards, it is in most cases right to lead the highest.

9. The second player, as a rule, should play his lowest card, in order to preserve his strength in the leader's suit. The first trick in the suit is left to partner, who has an even chance of holding a better card than the third player. But if the second hand has a strong sequence, he should play the lowest of the sequence, by which partner's hand may be saved, and a high card still remain over the original leader.

10. When a high card is led it is sometimes advisable for the second player to cover it with a higher one. For details of the play of the second hand, as regards playing a high card, or covering the card led, some systematic treatise should be studied.

11. When the second hand has none of the suit led he should trump, if he has but two or three trumps; but he should not trump a doubtful card if he has more than three trumps. This will be further explained when treating of the management of trumps.

12. The third hand, as a rule, plays his highest card in order to support partner in his suit. The exceptions are: with ace, queen, &c. the queen is to be played; and if partner has begun with a high card, it is often right to pass it.

13. *Management of Trumps.*—With strength in trumps (i.e. with four or more) they should not be used for trumping, if it can be avoided, but should be kept together, in hopes of establishing a suit, and of remaining with the long trump, with which to get the lead after the other trumps are out, and so to bring in the suit. Thus if the opponents lead a losing or doubtful card it is better, as a rule, not to trump it when holding four trumps. But if the opponents lead a winning card it is generally advisable to trump it, though holding four trumps.

14. With five trumps the chance of succeeding in exhausting the opponents' hands, and of remaining with the long trump, is so considerable that a player having five or more trumps should lead them; and as number is the principal element of strength, he should not be deterred from leading trumps merely because the fourth hand has turned up an honour.

15. With four trumps only, first lead the strong suit. When the adversaries' hands are cleared of that suit, or so far cleared that the holder of the long cards in that suit commands it, it is, as a rule, safe to lead from four trumps.

16. A player is only justified in leading from weak trumps if he holds winning cards in every suit; if the adversaries are both trumping a suit; or if the game is lost unless partner has strength.

17. It is most important to return partner's trump lead at once, unless he has led from weakness; for partner, by leading trumps, declares a strong game, and it is then the best policy to abandon one's own plans, and to support his.

18. It follows that a player should seldom lead a card for his partner to trump, unless he has four or more trumps; for with less than four trumps he is weak; if he forces his partner to trump, partner is weakened also; and the chances are that by weakening partner under such circumstances the command of trumps will remain with the adversaries.

19. But a player may force his partner, although weak himself, if partner has already been forced, and has not afterwards led trumps; if partner has already declared weakness in trumps, as by trumping a doubtful card second hand; if two partners can each trump a different suit; and when one trick from partner's hand wins or saves the game.

20. The same considerations which make it inexpedient to force partner when weak one's self show the advantage of forcing a strong trump-hand of the opponents.

There are yet some general rules of play to be explained.

21. The second, third, and fourth players should always play the lowest of a sequence. The rule here given is in conformity with the play that would naturally be adopted in playing cards that are not in sequence; and by keeping to a uniform plan players are enabled to infer what cards their partner does or does not hold. It is true that the adversaries often gain the same information; but it is found by experience that it is of more advantage to inform partner than to deceive the opponents.

22. As a rule, it is advisable to lead out the winning cards of partner's suit. The presumption is that he has led from his strong suit; and by leading out the winning cards the suit is cleared for him, and his long cards are not obstructed. The reverse applies to suits led by the adversaries. It is mostly right to retain the winning cards of such suits as long as possible, in order to stop the establishment of the suit.

23. When a player has none of the suit led, he should throw away from his weakest suit; for by discarding from a strong suit its numerical power is damaged. But when the adversaries have shown great strength in trumps it is not advisable to keep small cards of a long suit, as it is not likely that it can ever be brought in. Under such circumstances the player should throw away from his best protected suit, and keep guards to his weaker ones.

24. Players should watch the cards as they are played, and endeavour to infer from them where the others lie. Thus, if a player wins a queen

with an ace it may be inferred that he has not the king, the rule being to win with the lowest; if a player leads trumps at starting it may be inferred, as a rule, that he is strong in trumps, or has a very fine hand. By recording in this way, and by counting the number of cards played in each suit, skilled players will often, towards the close of a hand, know the position of all the important cards remaining in; and by means of this knowledge they will be able to play the end of the hand to the same advantage as though they had seen all the cards.

25. And lastly, players should play to the score. Thus, wanting but one trick to save or win the game, a winning card should be played at once. The example is stated as for one trick; but it should always be kept in mind how many tricks are requisite to win or save the game, or even a point, and the play should be varied accordingly.

ILLUSTRATIVE HAND.

The following example is given to show how the play at whist is conducted in accordance with the preceding general rules, and also how inferences from the fall of the cards may be drawn and used. The example is of the simplest kind, and is not intended to exhibit any fine stroke of play. A, Y, B, and Z are the four players; they sit round the table in the order of the letters, A B being partners against Y Z. A is the first leader, and Z the dealer. We will suppose the reader to be A, the score to be love-all, and Z to have turned up the two of hearts.

A'S HAND.

Ace, 2 of.....Spades.
Queen, 8, 7, 4 of .....Hearts.
9, 6, 5 of.....Clubs.
Queen, Knave, 7, 2 of.....Diamonds.

[*Note.*—It is a great assistance to inexperienced players to sort A's hand from a pack, and play a card to each trick from the remainder of the pack, as would be done in actual practice.]

THE PLAY.

[*Note.*—The cards in each trick are placed in the order in which they are played, the leader's card standing first. The capital letter in front of each card shows by whom it is played.]

TRICK 1. A leads. TRICK 1. Y wins.

Remark.—A leads from his strongest suit. He leads the lowest card of it. (For reasons, see above, sects. 1, 3.)

Inferences.—B being unable to win the king, A should note that the best diamond is against him, probably in Y's hand as the rule is with ace and king to put on king second hand. Some players put on king second hand with king and one small one; but the smallest should generally be played, unless the second hand holds a sequence. B dropping the nine, and A holding queen and knave (refer to A's hand), A concludes B to have ten or no more, the rule being to play the smallest when unable to head the trick.

It is in this way, by comparing the cards which fall with those remaining in hand, that players obtain an insight into the game to guide them in their future conduct.

TRICK 2. Y leads. TRICK 2. Z wins.

Inference.—A infers clubs to be Y's strongest suit. This inference does not affect the subsequent play. But it might; and, at all events, it is an inference that A ought to draw.

TRICK 3. Z leads. TRICK 3. Y wins.

Remark.—Z returns his partner's lead (for reasons, see sect. 5).

Several inferences might here be drawn as to the position of the remaining clubs—as, for instance, that B has the queen; but as they do not affect the play, they are omitted, for the sake of brevity.

TRICK 4. Y leads. TRICK 4. B wins.

Remark.—Y continues his suit (for reasons, see sect. 1).

TRICK 5. B leads. TRICK 5. A wins.

Inferences.—Spades may be taken to be B's strongest suit. B leads his fourth-best spade, in preference to his lowest. The reasons for preferring this card (an American lead) are too long for insertion here. They must be sought for in exhaustive treatises.

Z, putting on queen second hand, probably has king (see sect. 9). Also, he may be presumed not to hold the knave, or he would play the lowest of the sequence (see sect. 21).

TRICK 6. A leads. TRICK 6. B wins.

Remark.—A continues his suit. As a rule, with second and third best (in this case, queen and knave), one of those should be led; but B having played the nine to the king, in the first trick (refer to trick 1, and last inference therefrom), A would part with strength unnecessarily by leading a high card, as B either has the ten or will trump.

This is an example of departure from rule owing to previous fall of cards.

TRICK 7. B leads. TRICK 7. Z wins.

Remark.—B continues his suit.

Inference.—The ten falling from Y's hand, it may be inferred that he holds no more (see remark, trick 8).

TRICK 8. Z leads. TRICK 8. Y wins.

Remarks.—As regards the lead of the spade here, it may seem at the first glance to be contrary to the rules of play advocated in the preceding article. It is a return of the adversary's lead, and up to the strong hand. But it must be remembered that whist is not a stereotyped game of rule; rules can only be given for the general case, and they have to be departed from more or less frequently as the scheme of the hand becomes developed. Z is bound to play to force his partner in order to make the fifth trick, and so to save the game if Y has an honour. Owing to the American lead of seven of spades (at trick 5), Z can count that B remains

with three spades, all higher than the seven (the seven being his fourth best), and therefore that Y has no more spades.

A also can count that Y has no more spades. He trumps with the seven of hearts to prevent Y from winning the trick with a very small trump. As the cards happen to lie A's trump is wasted, but the play must not be judged by the result.

Trick 9. Y leads. Y B Z A Trick 9. A wins.

Remark.—Y leads the thirteenth club.

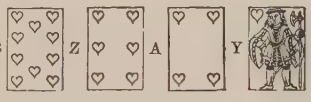
Inferences.—It is probable, from this lead, that Y has strength in trumps, such as an honour guarded. When a thirteenth card is led before trumps have been played, it generally means that the leader wants his partner to put on his best trump, in order to make trumps separately. It may be, however, that the leader only wants his partner to be led up to if the thirteenth card is trumped by the fourth hand. It is a difficult point in the game for the third hand to know whether to play a high trump on a thirteenth card or to pass it.

A further inference from this trick is that Z is weak in trumps, as he only puts on the five. If he trumps at all, he will most likely trump with his highest. Looking at the fact that if the trump lead comes from A the lead will be presumably up to a weak suit, and also that A has the best diamonds and his partner the remaining spades, A determines to lead a trump. Accordingly,

Trick 10. A leads. A Y B Z Trick 10. B wins.

Remark.—Holding but two of the suit, A leads his best (see sect. 6).

Trick 11. B leads. B Z A Y Trick 11. Y wins.



Remark.—B returns his partner's lead of trumps. As a rule, partner's trump lead should be returned immediately (see sect. 17); but it does not follow that B is bound to return trumps here, a strengthening trump being led late in the hand. B, however, does well to return the trump in this case, as, on the whole, the best chance for the odd trick is to bring down all the trumps, and to find A with the winning diamonds.

Tricks 12 and 13.—Y (trick 12) leads a diamond (he has only diamonds in hand), and A makes the knave and queen.

A B score the odd trick.

See various books, including *Principles of Whist* (1902) by 'Cavendish,' writer of the above article; also manuals by Pole, Foster.

Whistler, a large Marmot (q.v.) of the Rocky Mountains, closely allied to the woodchuck. The name (sometimes *Siffleur*) is derived from the sound it makes.

Whistler, James Abbott McNeill, the most original of American artists, was born at Lowell, Massachusetts, on the 10th July 1834, a son of Major George Washington Whistler, consulting engineer of the St Petersburg and Moscow Railway (1800–49). He studied for a time at West Point, but, turning to art, came to Paris, worked for two years in the studio of Gleyre, and in the fifties settled in London. In 1859 he began to exhibit in the Royal Academy, showing 'Two Etchings from Nature,' which were followed in 1860 by five dry-point portraits and etchings of Thames subjects, and an oil-picture of a mother and child 'At the Piano,' which was purchased by John Phillip, R.A. Three years later his 'White Girl' was rejected by the jury of the Paris Salon, but attracted attention in the Salon des Refusés. He exhibited frequently in the Salon, the Academy, the Grosvenor Gallery, and the Society of British Artists, and in 1874 and 1892 he held exhibitions of his paintings in London. A past president of the Society of British Artists, an officer of the Legion of Honour, and a member of a Bavarian order, he died 17th July 1903.

The finest of his oil-pictures are 'The Artist's Mother—an arrangement in Black and Gray,' shown in the Royal Academy of 1872, awarded a gold medal in the Salon of 1884, and purchased for the Luxembourg Gallery in 1891; the 'Portrait of Thomas Carlyle,' shown in the artist's exhibition of 1874, and purchased by the Glasgow Corporation in 1891; and the 'Portrait of Miss Alexander—Harmony in Gray and Green.' Among his other portraits were those of Sarasate and Irving as Philip II.; and he produced some fascinating figure subjects and views in oils. As a purely decorative artist he made a fame by the 'Peacock Room,' painted in 1877 in Mr Leyland's house at Prince's Gate, London, and by the 'Music Room' in Señor Sarasate's residence in Paris. As etcher and drypointer Whistler's eminence was even more widely recognised than as a worker in colour. The freedom, spirit, and unerring selection of line in the 214 etchings catalogued by Wedmore in 1886 ranked him as chief of contemporary 'painter-etchers.' His lithographs were of very varying merit.

An audacious genius, having much in common with the impressionists but of no school but his own, he startled equally philistines, artists, and art-critics by his *nocturnes* and 'arrangements' in unwonted colours, lights, and tones, and 'discovered the night as Turner discovered the sky.' He trusted for effect neither to attractiveness of subject nor to human interest or anecdotal interest; the charm of his work lies in its technical qualities, in its skilful combinations of tone and colour, of line and mass. When Ruskin made an assault on his paintings exhibited at the Grosvenor Gallery in 1877 (in *Fors Clavigera* for July of that year), the artist sued the critic for libel, and the trial ended in a verdict for the plaintiff of one farthing damages without costs. But Whistler retaliated in an amazingly clever and abusive pamphlet, 'Whistler *v.* Ruskin: Art and Art Critics,' which, along with a notable lecture, 'Ten O'Clock,' and occasional letters on art and personal subjects, was published as *The Gentle Art of Making Enemies* (1890; enlarged edition, 1892), a triumphant, cruel, witty, epigrammatic exhibition of the art of giving the utmost annoyance and pain to his critics. *The Baronet and the Butterfly* (1899) was another philippic; and Tom Taylor and Du Maurier were also amongst the victims of his ungentle skill in refined but intolerably scathing literary Billingsgate.

See Way and Dennis, *The Art of Whistler* (1901); Menpes, *Whistler as I Knew him* (1904); Wedmore, *Whistler and Others* (1906); the study by Cary (1907); the standard *Life* (1908), and *Whistler Journal* (1921) by E. R. and J. Pennell; Bibliography by Seitz (1910); Way, *Memories* (1912); Dodgson, *Etchings of Whistler* (1922).

Whiston, William, mathematical divine, was born at Norton rectory in Leicestershire, 9th December 1667. Educated privately, partly because his father's blindness required his aid, he at length entered Clare College, Cambridge, where he distinguished himself greatly in mathematics, and obtained a fellowship in 1693. He next be-

came chaplain to the Bishop of Norwich, and in 1698 was presented to the living of Lowestoft in Suffolk. His *Theory of the Earth* (1696) brought him a considerable reputation, and in 1703 he was appointed to succeed Newton in the Lucasian professorship at Cambridge. But his theological studies unfortunately led him to regard Arianism as the primitive form of Christianity, and with characteristic honesty he made no secret of his convictions. In 1710 he was expelled from his professorship and the university, and the case against him, if it was conducted deliberately without energy, at least lasted five years. He was preached against and refused communion by the clergy, foremost among whom raged Sacheverell. His *Primitive Christianity Revived* (5 vols. 1711–12) included the famous heretical essay on the Apostolic Constitutions. Whiston spent the remainder of a blameless and busy life in London, usually in straitened circumstances, incessantly employed in writing, in controversy, in scientific crotchets, lectures, and the services of a 'Primitive Christian' congregation he had started in his own house. Though an Arian he was a strong supernaturalist, and could defend causes such as prophecy and miracle—even anointing the sick and touching for the evil. His clerical monogamy —now remembered for Dr Primrose's sake alone—was the least whimsical of his peculiar notions, for his identification of the lost tribes of Israel with the Tartars has since been far surpassed. He died in London, 22d August 1752. Whiston's translation of Josephus (1737) is still printed—a carefully revised edition by the Rev. A. R. Shilleto was published in Bohn's Library in 1890; his Life of Samuel Clarke (1730) deserves to be; and the *Primitive New Testament* (1745) is a unique curiosity. His Memoir (3 vols. 1749–50) conveys a very vivid image of this strange, whimsical, eccentric, but thoroughly honest and conscientious man.

Whitbread, SAMUEL, born in 1758, a London brewer's son, from Eton passed to Oxford, and in 1790 entered parliament. Under Pitt he was leader of the opposition, and in 1805 headed the attack on Lord Melville. He was an intimate friend of Fox. He protested against the rupture of the peace of Amiens, and on Napoleon's escape from Elba denounced all interference with the French in their choice of a ruler. He died by his own hand when insane, 6th July 1815.

Whitby, a seaport and watering-place in the North Riding of Yorkshire, by rail 54½ miles (by road 48) NNE. of York, and 21 miles NNW. of Scarborough. It looks northward over the North Sea at the mouth of the river Esk, which here forms a wide tidal pool walled in by cliffs. An iron bridge (1909) which replaced the two-leaved swing bridge of 1835 connects the two halves of the town and leaves a waterway of 70 ft. The older portions on the east side with narrow streets and steep yards and red-tiled houses, climb tier upon tier up the cliff, where stand the ruined abbey of St Hilda and the ancient parish church of St Mary. St Hilda (614–680) founded in 657 the monastery of Streoneshalh for religious of both sexes, which has memory of Cædmon and St John of Beverley, and where, in 664, was held the great Synod of Whitby (see EASTER). It was burned by the Danes in 867, shortly after which the name was altered to Whitby, but in 1078 was refounded by William de Percy as a Benedictine abbey. The ruins of the Abbey Church, which was 300 ft. long, are Early English and Decorated in style, and comprise the choir, north transept (1245–58), and part of the nave. The building was finally completed 1310–25 and was presided over by 33 abbots, the last of whom—Henry de Val—surrendered it to Henry VIII. After that it was despoiled of everything of value, and the great central tower fell in 1830. The Office of Works have carried out extensive excavations and restored the portion demolished by the German bombardment in 1914. Between the abbey and the cliff is the parish church, originally Norman, gained from the town by a flight of 199 steps. On the south side is the Abbey House built chiefly from the ruins of the monastery in 1580. Other buildings of interest are the old town hall (1788), and Captain Cook's House in Grape Lane.

The modern town is situate on the West Cliff and is well laid out with gardens and pleasure grounds. The west and east piers with their extensions completed in 1914 are 900 and 400 yards long and protect an outer harbour, while the lighthouse on the west pier—like a Doric column—is 83 feet high. The whale-fishery (1783–1837) belongs to the past—as does the building of ships, which is now carried on by one firm only. Captain Cook, who was an apprentice here, chose Whitby-built vessels for his circumnavigation of the world, as having 'the stoutest bottoms in England.' The fishing industry is actively prosecuted and is increasing; but Whitby's speciality in Victorian and prehistoric days, the manufacture of jet ornaments, has greatly decayed. Whitby and the neighbourhood offer a ready field for geological research, and its museum contains one of the finest collections of fossils known, including large reptiles. Whitby is surrounded by the Yorkshire moors and scenery of remarkable variety and beauty. It returned one member of parliament from 1832 to 1885 and is now part of the Scarborough and Whitby parliamentary division. Population (1921) 12,512.

Whitby, DANIEL, was born at Rushden in Northamptonshire in 1638, studied at Trinity College, Oxford, graduating B.A. in 1657, and was elected fellow of his college in 1664. He became prebendary of Salisbury in 1668, rector of St Edmund's, Salisbury, in 1672, and died there, March 24, 1726. His first writings were a series of hot attacks on popery, but in 1683, unfortunately for his peace, he turned from rending the papists to seeking a basis of union with the Dissenters, and so brought down upon his head the furious wrath of Oxford and his bishop. His book, which was entitled *The Protestant Reconciler*, was publicly burned at Oxford, and his diocesan, Dr Seth Ward, made him sign a strong expression of his repentance for having 'through want of prudence and deference to authority' printed a book containing these false, erroneous, and schismatical principles: (1) that it is not lawful for superiors to impose anything in the worship of God not antecedently necessary; and (2) that the duty of not offending a weak brother is inconsistent with all human rights of making laws concerning indifferent things. In the second part of his *Protestant Reconciler*, published also in 1683, he attempted to smooth down the objections of the Dissenters to re-enter the Church of England. His next important task was *A Paraphrase and Commentary on the New Testament* (2 vols. 1753). In his *Discourse* on Election and Reprobation (1710) he spoke out the Arminianism for which he had exchanged the Calvinism of his training. Dr Clarke's *Scripture Doctrine of the Trinity* converted him to Arianism, and he published Arian tracts and treatises which brought him controversy with Waterland. In this faith he died, 24th March 1726, as we find from his *Last Thoughts* (1727).

Whitchurch, a market-town of Shropshire, on an eminence, 19 miles N. by E. of Shrewsbury by railway. Malting and brewing are carried on. Pop. (1921) 5656.

White. See WHITE PIGMENTS.

White, GILBERT, author of the *Natural History of Selborne*, was born at Selborne (q.v.) in Hampshire, on July 18, 1720. Educated at Basingstoke under the Wartons' father, in 1739 he entered Oriel College, Oxford, and in 1744 obtained a fellowship, in 1747 took orders, in 1752 became senior proctor of the university, and in 1758 accepted the sinecure college living of Morton Pinkney, Northamptonshire. Six years before he had retired to his native village, to indulge his taste for literature and natural history; and there he died on June 26, 1793. His charming *Natural History and Antiquities of Selborne* was projected in 1771, and published in 1789. The minuteness and general accuracy of his observation, and the simple skill and unaffected grace of his style, though not without a touch of 18th-century formality here and there, have given White the same classic rank as Izaac Walton. Probably no book on natural history has been more frequently reprinted. His MS. journal (1768–89) was found in 1880. Since 1890 the Selborne Society has published a periodical for like-minded field-naturalists, *Nature Notes*, continued as the *Selborne Magazine*. See *Bibliography* of White by E. A. Martin (1897), his *Life and Letters* (1901) by his great grand-nephew, R. Holt-White, and study (1909) by H. C. Shelley.

White, HENRY KIRKE, minor poet, was born son of a butcher at Nottingham, 21st March 1785. At fifteen he was apprenticed to an attorney, and here he gave his leisure hours to study with intemperate zeal. He also became a member of a literary society in Nottingham, and sent contributions to the *Monthly Mirror*. These soon attracted the attention of Hill, its proprietor, and Capel Lofft, on whose recommendation he published in 1803 a small volume of poems, which was received by the critics with a lack of enthusiasm into which his sensitive mind read malignity and hatred. But the book secured him the friendship of the kind-hearted Southey and the evangelical pontiff, the Rev. Charles Simeon, through whose influence a sizarship in St John's College, Cambridge, was procured for him. He gave himself to his studies with a zeal that consumed the energies of a constitution always delicate; consumption rapidly developed, and he sank into the grave, October 19, 1806. Southey edited his *Remains* (2 vols. 1807), with a sympathetic memoir, which does justice to his character, and more than justice to his poetry.

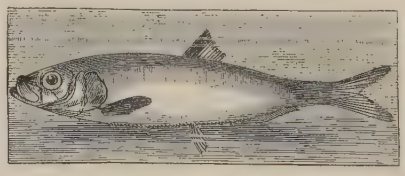
White, JOSEPH BLANCO, was born at Seville, July 11, 1775, descended from an Irish Catholic family settled in Spain. He was ordained a priest in 1799, but ere long lost his faith, and in 1810 made his way to England, where he lived the rest of his life. He was tutor to Lord Holland's son (1815–16), and took orders in the English Church, was made M.A. by diploma of Oxford in 1826, settled as a member of Oriel College, lived as tutor in Whately's family at Dublin (1832–35), but fled to Liverpool when he found it impossible longer to believe in the Trinity or the endowment of doctrines or Articles. He edited at London a monthly Spanish paper, *El Español* (1810–14), and when it stopped was granted a pension of £250 a year from the English government. He died at Liverpool, where he had lived six years, 20th May 1841. He contributed to the *Quarterly* and *Westminster* reviews, edited the short-lived *London Review*, wrote *Letters from Spain* (1822), *Practical and Internal Evidence against Catholicism* (1825), *Poor Man's Preservative against Popery* (1825), and *Second Travels of an Irish Gentleman in Search of a Religion* (2 vols. 1833). His most important work is the posthumous autobiography, edited by J. Hamilton Thom (3 vols. 1845), a remarkable self-revelation of a profoundly religious soul seeking for a certainty that is ever impossible to find. But Blanco White's name lives best in literature by his one immortal sonnet, 'Night and Death.'

White, RICHARD GRANT, Shakespearian scholar, was born in New York, 22nd May 1821, and died there, 8th April 1885. He graduated at New York university in 1839, next studied medicine, and then law, being admitted to the bar in 1845, but was finally drawn towards journalism. For fourteen years he contributed to the New York *Courier and Enquirer*, and during the civil war wrote a remarkable series of letters under the signature of 'A Yankee' for the London *Spectator*. He acted also for about twenty years as chief of the United States revenue marine bureau at New York. His acute criticisms on Payne Collier's emendations of Shakespeare (1852) first displayed that intimate knowledge of Shakespeare which gave so much value to *Shakespeare's Scholar* (1854), an annotated edition (12 vols. Boston, 1857–65), *The three parts of Henry VI.* (1859), *Memoirs of Shakespeare* (1865), the 'Riverside Edition' (1883), and the *Studies in Shakespeare* (1885). Other works were on the copyright question (1880) and on the English language.

White, WILLIAM HALE (1829–1913), journalist and miscellaneous writer, born at Bedford the son of a bookseller, who was doorkeeper to the House of Commons 1850–80. He qualified in 1851 for the congregational ministry, but was expelled for his unorthodox views. He owes his literary eminence to the powerful studies of domestic, social, moral, and theological problems dealt with in the remarkable trilogy of novels, *The Autobiography of Mark Rutherford* (1881), *Mark Rutherford's Deliverance* (1885), and *The Revolution in Tanner's Lane* (1887), 'edited by Reuben Shapcott.' Other works include some novels; translation of Spinoza's *Ethic* (1883; new ed. 1894); *The Apostasy of Wordsworth* (1898); a study of Bunyan (1904); *Pages from a Journal* (3 vols. 1900, 1910, 1915). He collected *Inner Life of the House of Commons* (1897), a series of articles by his father.

White, SIR WILLIAM HENRY (1845–1913), naval constructor, born at Devonport, was educated at the Royal School of Naval Architecture, from 1867 was on the Admiralty staff, and in 1881 became chief constructor. During 1883–85 he was at the Elswick works of Lord Armstrong, but he returned to the Admiralty as director of naval construction, becoming the responsible designer for all English vessels of war. He wrote a standard *Manual of Naval Architecture* and other technical treatises. See Life by F. Manning (1923).

Whitebait, the name by which the fry of the Herring (*Clupea harengus*) and Sprat (*Clupea sprattus*) are known in the market, and when served for the table, especially in London. It was formerly regarded as a distinct species, called by Cuvier *Rogenia alba*, by Yarrell and others *Clupea alba*.



Whitebait.

Whitebait fishing in the Thames is carried on chiefly from February to August. The length of these little fish is from 1 to 3½ inches. The sprat spawns in the Thames from April to June, and the youngest fry, about two months old, are first taken

in June. The smallest herring-fry in Thames whitebait are also about two months old, the larger as much as six months, while the largest sprats are probably nine months old. Whitebait are also taken in the estuary of the Forth between Alloa and Kincardine, and in the estuary of the Exe in Devonshire, but in the latter county such fry are locally known as *britt*. Whitebait are almost always taken in stow-nets or bag-nets, large funnel-shaped nets fixed to the rope by which the fishing-boat is moored. The boat is stationary in the tide-way, the fish are carried by the tide into the open mouth of the net, and collect in the small-meshed blind, or cod-end of the net. The fry of the herring and sprat occur in abundance at the mouths of rivers and in tidal estuaries wherever the adults are numerous in the neighbourhood. Shad-fry (*C. finta* and *alosa*) also sometimes occur with the young of sprats and herrings.

For the table whitebait (the *blanchaille* of English hotel *menus*) are fried with flour or crumbs; they are often laid on a napkin and sprinkled with fine flour and a little salt, rolled about till well covered with flour, and then thrown into a pot of boiling lard, where they remain till they are of a pale straw colour. Londoners resort to Greenwich and Blackwall to enjoy whitebait dinners. Towards the end of the 18th century it became the practice for the cabinet ministers to repair to Greenwich for a whitebait dinner every year before the prorogation of parliament in autumn —a practice revived by the Disraeli government in 1874 after its discontinuance by their predecessors, and till 1894 carried on with some intermissions. Some of the corporations of London indulge in a similar annual festivity, and the town-council of Exeter have also an annual dinner of which 'britt' is the characteristic feature.

White Caps. See VIGILANCE SOCIETIES.

White Colours. See WHITE PIGMENTS.

Whitefield, or STAND, a town of Lancashire, 5½ miles N. of Manchester. Dating from 1826, it has many fine residences, cotton manufactures, and neighbouring collieries. Pop. 7000.

Whitefield, GEORGE, one of the founders of Methodism, was born in the Bell Inn, Gloucester, 16th December 1714. He was the youngest of a family of six sons and a daughter, and he was but two when his father died. He had his schooling at St Mary de Crypt, Gloucester, next served about eighteen months as a drawer in his mother's public-house, and at eighteen entered Pembroke College, Oxford as a servitor. About three years earlier Charles Wesley and others had laid, in the university of Oxford, the foundations of Methodism (q.v.), and Whitefield ere long became conspicuous even amongst the young enthusiasts for zeal, for the austerity of his asceticism, and for labour too great for his strength among the sick and the prisoners in the gaol. His health gave way, but his native air soon restored him. His devotion and piety attracted the notice of Dr Benson, the bishop of the diocese, who gave him deacon's orders in June 1736. He preached his first sermon in the Crypt church with striking effect, next took his B.A. degree at Oxford, and preached in Bath, Bristol, London, and elsewhere.

Meanwhile Wesley had been in America establishing missions among the colonists, and in the beginning of 1738 Whitefield also went to Georgia for a few months, returning to be admitted to priest's orders, and to collect funds for the establishment of an orphanage in Georgia. The religious level of the age was low, and the clergy were themselves supine, slothful, and worldly, hence Whitefield found amongst his brethren the most active opposition. But when the parish pulpits were denied him he preached in the open air, the first time with marvellous effect, on Kingswood Hill, near Bristol, where the colliers heard him in thousands, the tears streaming down their grimy cheeks. From this time onwards he spent his life in constant travel and incessant preaching, everywhere moving audiences at his will by his irresistible earnestness and eloquence. Nor was it only the unlettered he could move, but critics so cold as Chesterfield, Bolingbroke, Hume, and Franklin.

About 1741 doctrinal differences on the question of predestination led to his separation from John Wesley—both of them being by this time disowned by the Established Church. Wesley took the Arminian view in the controversy; Whitefield adhered to Calvinism. After a short alienation the two friends were reconciled, and thenceforward their friendship was unbroken, although their ways led apart. Whitefield's supporters now built him a large shed at Moorfields —near Wesley's chapel—which being temporary was known as the Tabernacle; and his preaching gathered immense audiences around him. But he had no talent for organisation, and as soon as he went away on his frequent and protracted journeys his supporters began to disperse. Indeed he founded no distinct sect, his converts and adherents after his death either following the lead of the Countess of Huntingdon (q.v.) or joining other denominations, many in Wales becoming amalgamated through the guidance of Howell Harris into the body now known as the Calvinistic Methodists. The Countess of Huntingdon appointed Whitefield her chaplain, and built and endowed many chapels to maintain his Calvinistic doctrines.

Whitefield made no fewer than seven evangelistic visits to America, and the rest of his life was spent in preaching tours through England, Scotland, and Wales. In these he preached more than 18,000 sermons to ten millions of people. One of the most famous of these missionary journeys was that which he made to Scotland in 1741. He went thither on the invitation of Ralph and Ebenezer Erskine; but his notions were too catholic for his friends, who were disgusted when they found him as ready to preach in a parish church as to a seceding congregation, and more ready still to preach in the open air. At Cambuslang, in Lanarkshire (1742) his preaching produced one of the most remarkable revivals of modern times; many thousands were stricken with concern about their souls, and found expression for their excitement in violent physical manifestations. On his return from his first visit to Scotland Whitefield met and married a Welsh widow, Mrs James (November 1741). Southey asserts his marriage was not a happy one, but offers no proof; Cornelius Winter, who knew her more than a year before her death, says 'Whitefield was not happy in his wife . . . Her death set his mind much at liberty.' Whitefield set out for America for the last time in 1769. He was ailing at the beginning of the voyage, he was ill at the end of it, and he died somewhat suddenly not long after his arrival in America at Newburyport, near Boston, 30th September 1770.

Whitefield was above the middle size, and of well-proportioned figure. His eyes were dark blue, but were disfigured by a slight squint. His gestures were natural and effective, but his greatest gift was his marvellous voice, clear, full and musical—capable of reaching 20,000 men on a hillside. His writings by no means correspond with his fame—indeed nothing he has left behind is more than commonplace. The explanation of his unexampled power over his hearers must be sought in the burning earnestness and reality of his faith, the fluency and strength of his language, and

that vehemence and impetuosity of nature characteristic of the orator, as well as in the spiritual deadness of the time and the inherent fitness of his subject to the needs of the human heart.

His collected works—about 75 sermons, journals, and letters—together with the *Memoirs* by Dr Gillies, fill 7 vols. (1771–72). There are also Lives by Robert Philip (1838), Andrews (1864), Harsha (1866), Gledstone (1871 and 1900), but especially the Rev. L. Tyerman (2 vols. 1876). See also the *Life and Times of the Countess of Huntingdon* (2 vols. 1840); Stevens, *History of the Religious Movement of the 18th Century called Methodism* (New York, 1859–62); Dr Macaulay, *Whitefield Anecdotes* (1886); Sarah Tytler, *Countess of Huntingdon and her Circle* (1907).

Whitefish (*Coregonus clupeiformis*), the Common Whitefish, is the largest of all the Coregoni or American lake whitefish. It is very highly esteemed for food, ranking, indeed, as one of the finest of table fishes. Its range extends from Lake Champlain to the Arctic Circle. See COREGONUS.

Whitehall. See WESTMINSTER.

Whitehall, a 'village' of New York, at the head or southern extremity of Lake Champlain, and termination of the Champlain Canal, 78 miles by rail N. by E. of Albany. It has machine shops, various manufactories and mills, and an extensive trade in lumber. Pop. (1920) 5258.

Whitehaven, a seaport and municipal borough of Cumberland, near where the Solway Firth merges in the Irish Sea, 38 miles SW. of Carlisle and 80 NW. of Lancaster. Dating from 1633, it has owed its well-being to great collieries—some of them extending beneath the town and under the sea—and to the wealth of hæmatite iron ore found in the neighbourhood. There are iron and brass foundries, tanneries, flour-mills, brick-works, and carpet-mills. Whitehaven was attacked by Paul Jones (q.v.) in 1778, and suffered from a mining subsidence in 1791. It was a parliamentary borough, returning one member, from 1832 to 1918. Pop. (1851) 18,916; (1921) 19,536.

Whitehead, ALFRED NORTH, mathematician and philosopher, was born in 1861, and was educated at Trinity College, Cambridge, where he later became a fellow and mathematical lecturer. In 1914 he became professor of Applied Mathematics at London, and in 1924 professor of Philosophy at Harvard. His publications include *Mathematical Concepts of the Material World* (1906), *Organisation of Thought* (1917), *Principles of Natural Knowledge* (1919), *Concept of Nature* (1920), *Principle of Relativity* (1922), *Science and the Modern World* (1926), *Religion in the Making* (1927), and, with Bertrand Russell, *Principia Mathematica* (3 vols. 1910–13). Materialist philosophy is shown to be insufficient, and matter is regarded as 'organic mechanism,' actuated by an 'ordering entity.'

Whitehead, CHARLES, greatest poet of the name and the writer of at least one good novel, was born in London in 1804, the son of a prosperous wine-merchant. At first a clerk, he gave himself entirely to the life of letters soon after publishing *The Solitary* (1831), a poem of reflection of real promise. His *Autobiography of Jack Ketch* (1834) showed humour, and led to his being asked by Chapman and Hall to give them a popular humorous book in regular instalments. Fortunately for the world he declined, recommending to the publishers the young Dickens, who thus began the famous *Pickwick Papers*. His novel *Richard Savage* (1842) earned and deserved the praises of Dickens and Rossetti. Other works are the *Cavalier*, a poetic drama; the *Earl of Essex*, a historical romance (1843); *Smiles and Tears*, a collection of essays and stories (1847); and a *Life of Raleigh* (1854). Whitehead unfortunately fell into intemperance, went out to Melbourne to start afresh in 1857, but again sank, lost his wife, and died miserably in 1862, leaving unfinished the *Spanish Marriage*, a promising poetical drama. See *A Forgotten Genius*, a monograph by H. T. Mackenzie Bell (1884).

Whitehead, PAUL, 'a small poet' in Johnson's phrase, was born a tailor's son in Holborn, February 6, 1710, was apprenticed to a mercer, married a short-lived imbecile with a fortune of £10,000, lay some years in the Fleet for the non-payment of a sum for which he had stood security, became active in politics and as a poetical satirist, was one of the infamous monks of Medmenham Abbey (q.v.), became deputy-treasurer of the Chamber, and died 30th December 1774. The only satires of his that need be named are *State Dunces* (1733), inscribed to Pope, and *Manners* (1739), for which Dodsley was brought before the House of Lords. 'Whitehead, who,' says Johnson, 'hung loose upon society, skulked and escaped.' His writings were collected by Captain E. Thomson in 1777, but Churchill's couplet best preserves his name:

> May I (can worse disgrace of manhood fall?)
> Be born a Whitehead and baptised a Paul.

Whitehead, WILLIAM, Colley Cibber's successor as poet-laureate, was born a baker's son at Cambridge in 1715. He was helped to an education at Winchester and Clare Hall, Cambridge, and was elected fellow of his college in 1742. He made the grand tour as tutor to Lord Jersey's son, and by the family influence became in 1755 secretary and registrar of the Order of the Bath, and in 1757 poet-laureate. He died April 14, 1785. He wrote tragedies, elegies, comedies, farces, epistles, and all manner of other poems long quite forgotten, and deservedly. His poems were collected in 1754, and in 1774 in two volumes—a third volume, with a memoir by W. Mason, followed in 1788.

White Horse, the name applied to a figure of a horse on a hillside, formed by removing the turf so as to show the underlying chalk. Most of these figures are in Wiltshire, but Berkshire possesses the most famous of them all, that at Uffington, 4 miles SE. of Shrivenham. It measures 355 feet from nose to tail, and 120 from ear to heel; is traditionally supposed to commemorate Alfred the Great's victory of Ashdown (871); is mentioned about the reign of Henry II. as existing prior to 1084; and has been periodically 'scoured'—fourteen times between 1755 and 1857, and then not till 1884. The next most famous White Horse, that on Bratton Hill, near Westbury, is likewise said to commemorate a victory of Alfred's, that of Ethandun (878). It originally measured 100 by 54 feet, but now is 175 by 107, having been recut in 1778 and 1853. Other White Horses are those of Cherhill (1780; 129 × 142 feet), Marlborough (1804; renewed 1873; 62 × 47 feet), Pewsey (1812; 180 × 167 feet), Broad Hinton (1835; 90 × 90 feet), and Wootton Bassett (1864; 86 × 61 feet). Yorkshire has two White Horses, both modern—on Roulston Hill, near Northwaite, and the Hambledon Hills, near Thirsk; and on Mormond Hill, Aberdeenshire, are both a White Horse (18th century; 162 × 126 feet) and a stag (1870; 240 feet long). At Tysoe, Warwickshire, is a Red Horse (1461; 54 × 31 feet); near Weymouth is an equestrian figure of George III.; and similar figures of seeming antiquity are the Giant (180 feet long) on Trendle Hill, near Cerne-Abbas, Dorsetshire; the Long Man (240 × 148 feet) at Wilmington, Sussex, re-outlined in 1874; and the Cross (230 × 340 feet) at Whiteleaf, Bucks.

See the Rev. W. C. Plenderleath, *The White Horses of the West of England* (1885; new ed. 1892); Chambers's

Book of Days, vol. ii. p. 778; T. Hughes's *Scouring of the White Horse* (1858); W. Johnson's *Folk-memory* (1908).

White House. See WASHINGTON (City).

White Lady, a spectral figure which, according to popular legend, appears in many of the castles of Germany, as at Berlin, Neuhaus in Bohemia, Ansbach, Baireuth, Kleve, Darmstadt, Altenburg, as also in London, Copenhagen, Stockholm, and elsewhere, by night as well as by day, particularly when the death of any member of the family is imminent. She is regarded as the ancestress of the race, shows herself always in snow-white garments, carries a bunch of keys at her side, and sometimes rocks and watches over the children at night when their nurses sleep. The earliest historical instance of this apparition occurred in the 15th century, and is famous under the name of Bertha of Rosenberg (in Bohemia). The White Lady of other princely castles was identified with Bertha, and this was accounted for by the intermarriages of other princely houses with members of the house of Rosenberg. In the Schloss of Berlin she was seen in 1598, 1619, 1667, 1688, and again in 1840, 1850, and 1879. The White Lady of Avenel, in Scott's *Monastery*, is an ineffective imitation. It was long a common belief in the Highlands that many of the chiefs had some kind spirit to watch over the fortunes of their house. Popular tradition has many well-known legends about white ladies, who generally dwell in forts and mountains as enchanted maidens waiting for deliverance. They delight to appear in warm sunshine to poor shepherds or herd-boys. They are either combing their long hair, or washing themselves, drying wheat, beating flax, or spinning; they also point out treasures and beg for deliverance, offering as reward flowers, corn, or chaff, which gifts turn in the instant into silver and gold. They wear snow-white, or half white half black garments, and yellow or green shoes. All these and many other traits that appear in individual legends may be traced back to a goddess of German mythology who influences birth and death and presides over the ordering of the household. Still more distinctly the appellation White Lady and the name Bertha point back to the great goddess of nature, who appears under various names, and who, as *Berhta* ('the brilliant'), held her circuit on Twelfth-night and revealed her power. When the legend goes on to say that the Bohemian Bertha of the 15th century promised the workmen of Neuhaus a sweet soup on the completion of building the castle, and that this soup, along with carp, is still given in remembrance of it to the poor on Maundy Thursday, we may be permitted to recognise again the festival dishes consecrated to Berhta, such as fish, oatmeal gruel or dumplings, &c., which it is still customary to eat about the time of Twelfth-night and Christmas in most districts of Germany.

See Minutoli, *Die Weisse Frau* (Berl. 1850), and Schrammen, *Die Schicksals- oder Totenfrau im Haus der Hohenzollern* (Cologne, 1888).

White Lead. See LEAD.

White Leg (also called 'Milk-leg': technically *phlegmasia dolens*), an ailment occurring usually soon after parturition or following weakening acute diseases like pneumonia and enteric fever. There is swelling of the leg, hardness, whiteness of the skin, and thrombosis of the large veins.

Whitelocke, BULSTRODE, was born in London, 2d August 1605, and educated at Eton, Merchant Taylors' School, and St John's College, Oxford. The son of a judge, he studied at the Middle Temple, sat in the Long Parliament for Great Marlow, and took a half-hearted part on the popular side in the great struggle. In 1648 he was appointed one of the commissioners of the Great Seal. He would take no part in the king's trial, but he accepted a seat in the council of state, and was sent by Cromwell ambassador to Sweden (1653). He declined Cromwell's title of viscount, was nominated by Richard keeper of the Great Seal, but again steered prudently enough through that intricate period to be included in the Act of Oblivion. He died in 1676 at his house at Chilton in Wiltshire. Whitelocke's *Memorials* was first published in 1682 in a mutilated and falsified form, the anonymous editor, according to Wood, being Arthur, Earl of Annesley. A more satisfactory edition was that of 1732. The book is trustworthy, but Gardiner thought the earlier part to have been written from memory, and so defective with the inevitable defects of such a method. His *Journal of the Embassy to Sweden* was edited by H. Reeve (1855). See his *Memoirs* by R. H. Whitelocke (1860).

White Mountains, a group belonging to the Appalachians (q.v.), in New Hampshire (q.v.). Mount Washington has a practicable carriage-road and a hotel on its summit, with a powerful electric light.

White Pigments. The most important of these is *white lead*, which not only is very serviceable when used alone as a white colour, but in oil-painting most other colours are mixed with it to give them body. Commercial white lead is frequently mixed with sulphate of baryta (barium sulphate), but manufacturers of white lead object to this being called an adulteration, as the mixture is sold by them as such. Less common adulterations are Gypsum (q.v.), chalk, and china clay. *Flake White* is a pure white lead specially prepared for artists, and keeps its colour better than the kind commonly used by house-painters (see LEAD, and PIGMENTS). *Zinc White*, or oxide of zinc, is not so much used for artistic work in oil as flake white, but in house-painting it is often coated over a ground of white lead, zinc white not being liable to change by the action of sulphuretted hydrogen. As an oil-colour it wants body, and is a bad dryer. As a water-colour, under the name of Chinese white, it is very useful and permanent. *Baryta White, permanent white*, is the sulphate of baryta, and is best when artificially prepared. This pigment does not change in impure air, but is not much in favour for oil-painting, except to mix for some purposes with white lead, as it renders it less liable to alter in tint. White pigments are numerous, but these three are by far the most important.

White Plains, a residential city, capital of Westchester county, N.Y., 21 miles NNE. of New York city, and the centre of a large farming trade. An indecisive battle was fought here between the American forces under Washington, and the British, 28th October 1776. Pop. (1920) 21,031.

White River, rises in Arkansas, flows north-east into Missouri, then east, south-east, and south through Arkansas, and empties itself into the Mississippi near the mouth of the Arkansas. It is 800 miles long, and navigable 300 miles.

White Russia, a constituent republic of the Union of Soviet Socialist Republics (since the formation of the Union in 1923), bounded on the W. by Poland, on the S. by Ukraine, on the N. and E. by Russia proper. The soil is rather unproductive, and there is a considerable marsh region watered by the Pripet and its tributaries. To a certain extent, however, grain is cultivated, timber cut, and live stock raised. There are various educational institutions, including the White Russian State University and the Communist University. The capital is Minsk (130,000). The republic was formed in 1918. Area, 48,450 sq. m.; pop. (1926) 4,265,471. A considerable territory, inhabited mainly or largely by

White Russians, was added by conquest to Poland (Treaty of Riga, 1921). See RUSSIA (*White Russia, Ethnography*).

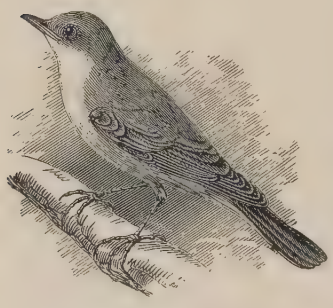
Whites. See LEUCORRHŒA.

White Sea (Russian *Bjeloje More*), a branch of the Arctic Ocean extending into the province of Archangel in the north of Russia. About 100 miles wide between the Kaninskaia and Kola peninsulas, it narrows to less than 50 farther south, widens again and forms three gulfs, the Kandalak Gulf, that of Archangel, into which the Dwina falls, and that into which the Onega falls. The sea-route hither was discovered by Chancellor in 1553; Archangel (q.v.) is the chief emporium on its shores. It is usually frozen from the beginning of September till the end of May; and even during the other months, when navigation is possible, it is not free from floating ice, and heavy fogs are frequent. The area is about 50,000 sq. m. By canals connected with the Dwina, it has direct water communication with the Dnieper and the Volga, and so with the Black Sea and the Caspian.

White Sulphur Springs, a watering-place of West Virginia, 227 miles by rail W. of Richmond. It was at one time the most popular summer-resort in the southern states, lies amid fine mountain scenery, and contains several large hotels.

White Swelling, a disease of the Joints (q.v.), of tuberculous nature, in which the synovial membrane passes into pulpy degeneration.

Whitethroat (*Sylvia communis*), a bird of the family Sylviidæ, a summer visitant to the British Isles; plentiful during summer in the greater part of England and in Ireland, but rarer in the north of Scotland, where, however, it is also extending its range, breeding regularly as far north as the Dornoch Firth. It is also common during summer in the south and middle of Europe, and is found even in the north. It places its nest in a low bush, or among a tangled mass of brambles and weeds. Its food consists of insects, berries and other fruit.



Whitethroat (*Sylvia communis*).

Its song is not very sweet, but is delivered with great energy, and it seems to vie with other birds in singing, refusing to be outdone. It is very lively and amusing as a cage-bird, and very easily tamed. The whole length of the whitethroat is 5½ inches. Its plumage is brown of various shades; the breast and belly brownish white, tinged with rose-colour in the male. The Lesser Whitethroat (*Sylvia curruca*) is a species of much rarer occurrence, and less extensive in its distribution in the British Isles. Whitethroats belong to the same genus as the Blackcap (q.v.) and the Garden Warbler (*S. simplex*), which is not uncommon in Britain, and almost rivals the blackcap in the richness of its notes.

White Vitriol. See ZINC.

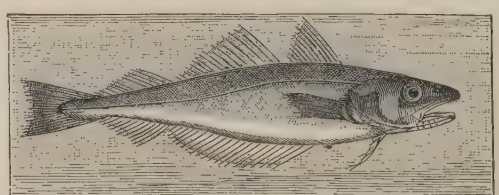
Whitewash, slaked quicklime, reduced to the consistency of milk by means of water. It is used for colouring walls, and as a disinfectant. If merely for colouring, a little size is added, but not when used for sanitary purposes.

Whitgift, JOHN, Archbishop of Canterbury, was born a merchant's son at Great Grimsby, Lincolnshire, in 1530 or 1533. He was brought up at Wellow Abbey, near Grimsby, where his uncle was abbot, and at St Anthony's School in London, and in 1549 entered Queens' College, Cambridge, but migrated next year to Pembroke Hall. In 1555 he was elected a fellow of Peterhouse, and, protected by its master during the Marian persecution, took orders in 1560, and from the Bishop of Ely, to whom he was chaplain, received the Cambridgeshire rectory of Teversham. He became successively Lady Margaret professor of Divinity (1663), Master of Pembroke, a queen's chaplain, a D.D., regius professor of Divinity, and Master of Trinity (1567), Dean of Lincoln (1571), Bishop of Worcester (1577), Archbishop of Canterbury (1583), and a privy-councillor (1586). Several of these offices he held conjointly, for he was a great pluralist. Having attended Queen Elizabeth in her last moments, and crowned James I., he died at Lambeth, 29th February 1604, and was buried at Croydon, where in 1596 he had founded an almshouse. With a decided Calvinistic bias, Whitgift yet was a steadfast champion of conformity, and in his controversy with Thomas Cartwright (q.v.) is held to have vindicated the Anglican position against the Puritans with no less ability than Jewell showed in defending it against the Romanists. Stow, Camden, Wotton, and Fuller concur in their praise of Whitgift, and it was reserved for Macaulay to stigmatise him as 'a sycophant and oppressor.' His works were edited for the Parker Society by the Rev. John Ayre (3 vols. 1851–53).

See vol. ii. of Cooper's *Athenæ Cantabrigienses* (1861) for a bibliography of his ninety-four writings; vol. v. of Hook's *Lives of the Archbishops of Canterbury* (1875); and Clayton's *Archbishop Whitgift and his Times* (1911).

Whithorn, a royal burgh in Wigtownshire, 3¼ miles NW. of the Isle of Whithorn, 12¼ miles S. of Wigtown by rail. Pop. (1851) 1652; (1921) 1033. Ptolemy makes mention of the place as *Leukopibia*, a town of the Novantæ—the name most likely synonymous with the Latin *Candida Casa*, the Old English *Hwit-aern*. Here at any rate St Ninian (q.v.) founded *Candida Casa* or church of Whithorn, dedicating it to St Martin, who had just died (397), and here he was buried in 432. From this place the monastery of Rosnat spread the light far and wide, and here a bishopric was founded by the Angles in 727, which was, however, removed in 796. At length under David I. Fergus, lord of Galloway, re-established the see of Galloway, founding here also a Premonstratensian priory, whose church became the cathedral. In early times pilgrimages were made hither from all parts of Scotland; James IV. came at least once a year, and we find Margaret, queen of James III., visiting it in 1473, and James V. in 1532 and 1533. Here in 1514 died the aged Earl of Angus, 'Bell-the-Cat. There remains now only a mere, roofless, ivy-grown ruin.

Whiting (*Gadus merlangus*, Linn.), a species of fish of the family Gadidæ. Like the cod, haddock, pout, and poor cod, this species has the upper jaw longer than the lower, but it is distinguished among the species possessing this character by the fact that it has no barbule on the



Whiting (*Gadus merlangus*).

chin. Other specific characters are the pellucid silvery colour of the sides, the presence of a dark mark at the base of the pectoral fin, and the white border of the ventral and dorsal fins. The posterior edge of the tail is straight or but slightly emarginate, the depth of the body moderate; the anus is situated beneath the middle of the dorsal fin. As in all species of Gadus there are three dorsal fins and two ventral. The scales are small. The range of the whiting is the European coast from Scandinavia to the Mediterranean. It is abundant on British coasts, especially on the south and west coasts of England and Ireland, comparatively rare on the northern coasts of Scotland. It has been recorded as large as 16 inches in length and 3 to 4 lb. in weight, and some specimens are said to have reached 8 lb., but the usual size is about 1 or 2 lb. It is a voracious fish, feeding both on the bottom on crustacea and in midwater on small fish, such as sprats, young pilchards, &c. It also feeds on molluscs and worms, but to a less extent. It is caught both by the trawl and by hand-lines, and in Scotland also by long-lines. In Scotland mussels are chiefly used as bait; in England, pilchard, squid, herring, or mackerel.

The whiting breeds in spring, from March to May; the eggs, as in other Gadidæ, are transparent and buoyant and dispersed separately in the water. It is in high esteem for the table, and is regarded as particularly delicate and easy of digestion. The flesh is of a pearly whiteness, whence the English name. It very soon suffers change, however, and is in good condition only a short time after being caught; but great numbers of small whitings are sent to market, salted and dried, under various names.

Whiting is simply chalk ground and washed to separate impurities. It is extensively used as a size-colour, for cleaning silver and other metals, as well as glass, and in preparing frames for gilding; and (in milk) may be used as an antidote to poisoning by oxalic acid. It is often mixed with white lead as an adulterant.

Whitley Councils were first proposed in 1917 by a committee presided over by Rt. Hon. J. H. Whitley (elected in 1921 Speaker of the House of Commons). In various industries (where no such machinery existed), Joint Industrial Councils were formed, consisting of equal numbers of employers and employed, to work in friendly co-operation, to discuss questions of wages, hours, &c., and generally to share the responsibility and management. See TRADE UNIONS (*Conciliation*).

Whitlow, or PARONYCHIA, is a painful inflammatory affection of the fingers, almost always proceeding to suppuration. There are several varieties of this affection, according to the texture primarily attacked; thus, it may be situated in the skin, the cellular (or connective) tissue beneath the skin or under the nail, the tendons or tendinous sheaths running along the fingers, or the periosteum. If the skin be the seat of inflammation vesicles appear, which soon discharge pus, after which relief is rapidly afforded. Such cases require little care or attention, and give rise to hardly any constitutional disturbance. If the cellular tissue be the primary seat of inflammation there is a painful sensation of tenseness and throbbing of the part, and often considerable febrile disturbance, until the pus can be evacuated. Although this form is painful no serious mischief is to be apprehended. When, however, the tendons and their sheaths, or the periosteum, are affected, a much more serious form of whitlow is developed, which has been already discussed in the article TENDON. In this form, especially when the thumb or the little finger is affected, the suppuration may extend up the arm and occasion destruction of the joints, and even death.

Whitlow may originate either spontaneously or after an external injury, such as a prick from a needle, thorn, &c. In the treatment of the milder forms the finger or thumb should be enveloped in an antiseptic dressing. When matter shows itself, an incision should be made to admit of its escape. Even if suppuration has not taken place, a free incision into the inflamed part often gives great relief, and much limits the extension of the inflammation.

Whitman, WALT, the unique poetic celebrant of Democracy, the Pindaric laudator of the 'average man,' was born, of mingled English and Dutch stock, on 31st May 1819, at West Hills, Long Island, in New York state, and died on 27th March 1892. Like many another man of genius Whitman seems to have owed little to his formal education, as he left school at the age of twelve to serve first in a lawyer's and then in a doctor's office, and finally in a printer's as an apprentice or learner. But that he profited by such schooling as he had (in the public schools of New York state) is shown by the fact that his next employment was that of itinerant teacher in country schools. He returned shortly to his printing, with spells of summer holiday and even farm-work, and in 1846 became editor of the *Brooklyn Eagle*. This and his other numerous press engagements were only of short duration, a certain restlessness, love of wandering, and eagerness for fresh experiences making him pass rapidly from one post or employment to another. He even built and sold houses at one time, and was in serious peril of growing wealthy on the proceeds, a peril he was zealous and successful in avoiding. All along haunted by the yearning and sense of obligation to produce a life-work, Whitman seemed quite unable to find full and free expressions for his emotions and thoughts until he hit upon the curious, irregular, recitative measures in which he composed the *Leaves of Grass*. When first issued in 1855 this unique publication was but a small quarto of 94 pages, but it grew in the course of the seven succeeding editions till it contained nearly 400 pages. The later and complete editions, taken together with his prose book *Specimen Days and Collect*, may be held to embrace the life-work of Whitman as a writer. But Whitman least of all men was content with an idle and remote spectatorship of life; he was ever bold and determined to face and grapple with life's saddest and sternest realities, to put the full strength of his shoulder to the burden of his fellows. Thus it came that summoned to tend his own brother, wounded in the war against the South, he became the brother-nurse to every wounded or sick mother's son in the Northern army. Not Florence Nightingale's self could be more tender and more beloved than the stalwart, bearded Walt, passing like a broad sunbeam from bedside to bedside in the long hospital wards, with cheery words and helpful offices to the living and last hand-clasp and brotherly kiss to dying comrades. The exertion, the exposure, and the high nervous and emotional strain Whitman underwent in these few years left him a shattered and almost aged man. About the close of the war he received (the magnificent reward of devotion and genius) a subordinate clerkship under government, and was summarily dismissed by Secretary Harlan as the author of 'an indecent book'; though he fortunately obtained a similar post almost immediately. In 1874 he left Washington for Camden, New Jersey, where he lived till his death. Partially paralysed as he now was, Whitman was in no small danger of falling into absolute poverty, had it not been for the timely help of his admirers beyond the Atlantic, a movement in

which Tennyson, Carlyle, and Ruskin and other leading authors took generous and active part. Later on several wealthy American citizens honoured themselves and their country by liberally providing for the aged poet's simple wants.

All the auspices seem in favour of Whitman's immortality: the neglect of his own countrymen, tempered only by ridicule, abuse, and even persecution; the recognition by a few of the leading minds of Europe and America; his slow emergence into acceptance and appreciation if not into popularity; all these seem auguries of a true man of genius. Although Whitman, like Carlyle and Browning, may be a dangerous and dangerously easy model for disciples to imitate, he undoubtedly worked out for himself a style of distinction as notable as theirs. This in itself is a title to fame, or at least a charm against oblivion, even though his style, like that of Lyly, runs to extremes and vices. This style or form is a sort of rhythmic recitative or irregular chant, the precursors of which may be found in the English translation of the Psalms and other Biblical poems, in Macpherson's *Ossian*, and in the later poems of William Blake. These chants vary in movement, and seem governed by laws rhythmic rather than metric, which (like the grammar of an unwritten tongue) have never been formulated even by the inventor himself. They have a peculiar, wild, stirring charm, which is apt to make regular verses seem tame and insipid after them. As to subject, Whitman set himself the Atlantean task of uplifting into the sphere or dominion of poetry the whole of modern life and man, omitting nothing, concealing nothing. Like Wordsworth, he would sing 'man as man,' only with a far wider and bolder sweep of subject and greater daring of treatment. His thesis is that of St Peter's vision; 'there is nothing common or unclean.' Hence the logical necessity with Whitman to include the treatment of subjects which in modern society were tabooed as obscene and unmentionable; hence too the accusations of indecency, so just and pertinent from the accuser's point of view, so futile and irrelevant from that of the accused. Whitman is in fact an idealist who has bound himself by a solemn vow to be a thorough-going realist; and it is his resolute and often successful endeavour to secure this union that gives his work its exceptional artistic quality. He is a prince of impressionists in literature. But so high and hard is the task Whitman sets himself that it is no matter of surprise that he sometimes, if not often, fails, and from heights where he was approaching the sublime falls perilously near the ridiculous. It is the fate of all artists who strive for the highest things that their failures—often only apparent—are more easily detected than their solid achievements; hence the contumely and ridicule that a Turner or a Wordsworth, Keats, or Landor, or Shelley suffers at the hands of a clever but uninitiated criticism. So largely with Whitman; but it is better to approach him in the same spirit that he has shown toward man and nature, that of for ever seeking for what is great and good, while outfacing steadily and bravely every stern and refractory reality.

Whitman's complete writings were published in 1902 in 10 vols. ed. Triggs, but numerous selections of his poems have been made, including those of W. M. Rossetti (1868; new ed. 1910), Bullett (1924). E. Holloway edited *Uncollected Poetry and Prose* (2 vols. 1922). See studies by Clarke (1892), Addington Symonds (1893), Burroughs (1896), de Sélincourt (1914), Holloway (1926); critical Lives by Bucke (1883), Binns (1905), Perry (1906), John Bailey (1926), E. H. Whitman (1926); *Diaries*, ed. Kennedy (1904); Traubel, *With Walt Whitman in Camden* (1906); *Letters*, ed. Harned (1919).

Whitney, Eli, American inventor, was born at Westborough, Massachusetts, December 8, 1765, and was educated at Yale College, where he paid his expenses partly by school-teaching, partly by mechanical labour. Having graduated in 1792, he went to Georgia as a teacher, but finding a generous patron in the widow of General Greene, of the Revolutionary army, he resided on her estate and studied law. The cotton culture at this period, especially that of the best kind, the 'green seed,' was limited by the slow and difficult work of separating the cotton from the seed by hand. Whitney set to work to remedy this under great disadvantages, for he had to make his own tools; but the reports of his success prompted some lawless people to break into his workshop and steal his machine, and get others made before he could secure a patent. He, however, formed a partnership with one Miller in 1793, and went to Connecticut to manufacture cotton gins; but the lawsuits in defence of his rights carried off all his profits and $50,000 voted him by the state of South Carolina. Finally in 1798 he got a government contract for the manufacture of firearms, and was the first to effect the division of labour by which each part was made separately. He made a fortune by this manufacture, carried out with ingenious machinery at Whitneyville, Connecticut; while he had but barren honour from the gin, one of the most important of the whole series of inventions connected with the cotton manufacture. He died at New Haven, January 8, 1825. See Cotton, p. 505.

Whitney, Josiah Dwight, geologist, was born in Northampton, Massachusetts, 23d November 1819, graduated at Yale in 1839, and the year after joined the survey of New Hampshire. The years 1842–47 he spent in study in Europe, returning to explore, together with J. W. Foster, the Lake Superior region. Their *Synopsis* of the explorations was published in 1849; their *Report* on the geology, 1850–51. Whitney next spent two years travelling in the states east of the Mississippi, of which the fruit was *The Metallic Wealth of the United States* (1854). Appointed state chemist and professor in the Iowa state university in 1855, together with James Hall, he issued the *Reports* on its geological survey (1858–59); and in 1858–60 took part in the survey of the lead region of the upper Missouri, publishing, again with Hall, his *Report* (1862). He was appointed state geologist of California in 1860, and laboured on the survey of that state till 1874, publishing in six volumes his *Geological Survey of California* (1864–70). In 1865 he was appointed to the chair of Geology at Harvard. He had the honour of giving his name to the highest mountain in the United States. His *Yosemite Guidebook* was published in 1869. He died in August 1806.—His brother, William Dwight Whitney, philologist, was born in Northampton, Massachusetts, 9th February 1827, graduated at Williams in 1845, and was three years thereafter clerk in a bank, studying Sanskrit the while. In 1849–50 he studied at Yale, then went to Germany, studying at Berlin under Bopp and Weber, and at Tübingen under Roth, with whom he prepared an edition of the *Atharva Veda Sanhita* (Berlin, 1856). In 1854 he was appointed professor of Sanskrit at Yale, in 1870 also of Comparative Philology. A member of the American Oriental Society from 1849, he was its librarian (1855–73), its corresponding secretary (1857–84), and then its president. His contributions to the *Journal* of the society were no less numerous than important, including a translation of the *Sûrya Siddhânta* (1860); text with notes of the *Atharva Veda Prâtiçâkhya* (1862); the text with notes of the *Taittirîya Prâtiçâkhya* (1871), which was awarded the Bopp prize by the Berlin Academy as the most important Sanskrit publication of the preceding three years; and the Index Verborum to the *Atharva Veda* (1881). He

contributed also to the great Sanskrit dictionary of Böhtlingk and Roth (7 vols. St Petersburg, 1853–67). He died 17th June 1894. Professor Whitney was undoubtedly one of the foremost Sanskrit scholars of the day. As a scientific philologist he belonged to the school that ascribes the development of speech to the acceptance of conventional signs, its origin imitative rather than an intuitive concomitant of thought. He waged warfare with Max-Müller on fundamental questions of the science of language, and those interested in such controversies will find the European scholar's onslaught on Whitney at length in the fourth volume of his *Chips from a German Workshop* (1875).

Other works of Whitney's are *On Material and Form in Language* (1872); *Darwinism and Language* (1874); *Logical Consistency in Views of Language* (1880); *Mixture in Language* (1881); compendious German *Grammar* (1869), *Reader* (1870), and *Dictionary* (1877); *Oriental and Linguistic Studies* (1873–75); *Life and Growth of Language*, in International Science Series (1876); *Essentials of English Grammar* (1877); *Sanskrit Grammar* (1879); *Practical French Grammar* (1886). He was also editor-in-chief of the great *Century Dictionary* (6 vols. New York, 1889–91).

Whitney, Mount, the highest mountain of the United States outside of Alaska, is in the Sierra Nevada in southern California, and has a height of 14,501 feet.

Whitstable, a long, straggling village in Kent, on the south shore of the Thames estuary, at the mouth of the Swale, 6 miles NNW. of Canterbury. It is famous for the delicacy of its oysters. Pop. of urban district (1921) 9842.

Whitsunday. See Pentecost. In Scotland it is one of the usual Terms (q.v.) for regulating the letting of houses and farms—its connection with the Sunday of Whitsuntide or with any Sunday having wholly passed from the popular consciousness. It was formerly movable, but was fixed in 1690 to mean the 15th May. In many respects local usage used to overrule the statute. Thus, in Edinburgh, the term of entry to a house was the 25th May until 1881, when by an act for Scotland it was declared to be the 28th; but rents are payable on the 15th.

Whittier, John Greenleaf, the sweet American 'Quaker poet' and sturdy abolitionist, was born near Haverhill, Massachusetts, on the 17th December 1807, belonging thus to the same golden decade that gave Emerson and Longfellow to America, Tennyson and the Brownings to England. The son of a poor farmer, who was also shoemaker, young Whittier obtained his formal education only with that struggle which seems so much better to foster genius than the possession of all the advantages, as they are called. While the bodily frame that so well served him till his peaceful decease on the 7th of September of 1892 was developed and hardened by his healthy, if arduous, outdoor life, his observation was roused and quickened, his imagination fired and coloured by the shining pages of nature's volume spread out continually before him. He wandered the New England meadows with the voices of Burns and Wordsworth for ever in his ears. He had, too, a notable schoolmaster in Joseph Coffin, an enthusiastic collector of all local legends and antiquities, thus adding to wild nature the weirder interest of strange, dark, and thrilling human deeds and dread-born superstitions. For his technical education, for better or worse, Whittier was apprenticed to journalism, beginning with contributions to the 'Poet's Corner' and as early as 1829 undertaking the editorship of the *American Manufacturer*, and in 1830 that of the *New England Weekly Review*, published at Hartford, Connecticut. His next move was a return to his native town to a similar post on the *Haverhill Gazette* in 1832, after having published in the previous year *Legends of New England* and *Moll Pitcher*. Long before this his poetry had attracted the admiration of William Lloyd Garrison, the champion of 'Abolition,' who rode over from Newburyport to see Whittier when quite a lad, and became his life-long friend. So it fell out that, if Garrison may be called the preacher or prophet, Whittier must be wreathed the poet-laureate of abolition (even though Emerson has touched the subject with more puissant pen). Thenceforward, whether with the bright flashing blade of his noble poetic rhetoric or the sounding quarter-staff of his earnest and manly prose, he fought the long, hot, dangerous battle of emancipation through contempt and defeat to lasting and complete victory. Apart from this strenuous and heroic struggle there is nothing epoch-making in Whittier's life literary or personal. In 1840 he settled in the quiet of Amesbury, a village near his birthplace.

Of Whittier's collected prose works it may be said generally that the historical interest is stronger than the literary; for his prose never rises to the high levels of his poetry, and its main interest lies in the fact that in it we have the work, we may almost say the life-work, of a very earnest and excellent man. The contents of these volumes consist chiefly of articles which have long since served their purpose; and as permanent contributions to literature they lack the masterly style which has in some instances rendered immortal what would otherwise be of but transient interest. Beyond the Atlantic the name abolitionist has never probably obtained the credit that was due to it, mainly because it was hard for an Englishman to realise the high moral and physical courage which the man or the woman must have who passed by that name, not in the slave states merely, but in the North itself, fated though the North was to fight and bleed and conquer in that very cause.

Whittier's claim to immortality lies clearly in his poetry, and there in very small bulk. His anti-slavery poems have for the most part served their purpose, and with some few exceptions, such as the pathetic and spirited 'Slaves of Martinique,' can hardly be of enduring interest. His nature poetry is faithful, fresh, and beautiful, without being quite original, and his ballads of moral heroism, 'Barclay of Ury' and 'Barbara Frietchie,' if a little wanting in pith and sustained force, rank high among poems of that class; but it is when he soars into the spiritual and even mystic spheres, as in 'My Psalm,' that, rising lark-like, his notes come clearest, sweetest, and truest. At lower levels his note is often less certain or even is often ill-sustained. Concerned rather with the feelings and thoughts (neither of them very remarkable) which he desires to express than with poetic form, he lacks the true enthusiasm of the artist for the *technique* of his work; hence blemishes are often only too patent. Whittier had not, in fact, the quality of originality of the first order nor of that expansiveness which itself becomes the equivalent of originality. No man could be more faithful to his principles, more true to his conscience, and more single in his aspirations towards what was right; no man could cherish through a long life a faith more simple and exalted, or declare with more clearness and insistence his high spiritual message. All these things make a man good and great; they leave him with a lasting influence over kindred minds; but they alone will hardly secure him immortality as a great writer or cause him to take rank among the real thinkers of his age. What will longest remain to

us will be the record of a long, pure, and blameless life, and a few of his poems in which, as by a rare and happy fortune, the outbreathings of a sweet and exalted spirit have come to us in a form as exalted and as sweet.

An edition of the poems appeared in 7 vols. in 1888–89; another, containing the posthumous *At Sundown*, in 1894; the Cambridge edition (1894) was reissued in England in 1899. W. G. Horder produced an edition in 1910. See Lives by Underwood (1875; new ed. 1883), Kennedy (1882), W. J. Linton (1893), Pickard (1894), Lewis (1913).

Whittington, RICHARD, the apprentice's model, is supposed to have been born about 1358, youngest son of Sir William Whittington of Pauntley in Gloucestershire. His father dying, Richard set out for London at thirteen to push his fortune, and apprenticed himself to Sir John Fitz-Warren, a prosperous mercer, whose daughter he afterwards married. We find him a member of the Mercer's Company in 1392, the year after an alderman and sheriff. In 1397 he was chosen Mayor of London to fill the place of Adam Bamme who had died in his year of office, again in 1406, member of parliament for the city in 1416, and in 1419 for the third time mayor. He was knighted by Henry V., and died in the spring of 1423, and by his will rebuilt Newgate and St Michael's Church, connecting also a college and an almshouse with it, while he also restored St Bartholomew's Hospital, gave a library to Grey Friars, and provided drinking fountains.

See the Rev. Sam. Lysons' *Model Merchant of the Middle Ages* (1860), and Besant and Rice's *Sir Richard Whittington* (1881). Lysons defended the famous traditional story of the beginning of Dick Whittington's good-fortune being the lucky sale of the cat he had committed to a friendly sailor to a Moorish king sorely distressed with rats and mice. He refused to hear of the explanation that he traded with *cats* (three-masted vessels of about 500 tons) and sea-coal. But even if the modern story and the representation of the cat go back to the 16th century, their historical character is still not proved. And unfortunately the main elements of the story are familiar in German, Italian, Russian, and Danish folklore. But none need doubt the other part of his romantic history, of how when a poor boy aweary of London he had made up his mind to fly, but was arrested on Highgate Hill by a merry peal from Bow Bells which rang to his ears 'Turn again, Whittington, Lord Mayor of London.'

Whittlesey, or WHITTLESEA, an urban district of the Isle of Ely, 5½ miles E. by S. of Peterborough. Pop. 4000. *Whittlesey Mere*, a large shallow lake in the north of Huntingdonshire, 4 miles SW. of Whittlesey, abounded in fish and in water-fowl, but was drained in 1851, and is now laid out in cultivation.

Whitworth, a town of Lancashire, 3 miles N. by W. of Rochdale, with cotton manufactures and collieries. Pop. 8800.

Whitworth, SIR JOSEPH (1803–87), inventor, was born at Stockport, set up as a toolmaker in 1833 at Manchester, investigated the construction of plane surfaces of metal, and made greater accuracy of workmanship possible. He worked on screw threads, exhibited many machines at the exhibition of 1851, and invented both guns and rifles of compressed steel with spiral polygonal bores. He founded Whitworth scholarships for encouraging engineering science, and wrote considerably on his own subjects. In 1897 the Whitworth works and the Elswick works of Lord Armstrong were amalgamated.

Whooper. See SWAN.

Whooping-cough. See HOOPING-COUGH.

Whortleberry (*Vaccinium*), a genus of small shrubs, of the family Vacciniaceæ, having a four- to five-toothed calyx, a four- to five-cleft bell-shaped or urceolate corolla, with the limb bent back, eight or ten stamens, with two-horned anthers, and a four- to five-celled many-seeded berry. The species are numerous, mostly natives of the northern parts of the world, with evergreen or deciduous, more or less ovate leaves. The Common Whortleberry, or Bilberry (*V. Myrtillus*), called in Scotland the *Blaeberry*, is very common in Britain, and in the middle and north of Europe. It is found also in Iceland and in the northern regions of North America. It varies from a few inches to almost 2 feet in height, and has ovate deciduous leaves, and dark purple berries, covered with a mealy bloom. A variety occurs, but rarely, with white berries. The berries are very sweet and agreeable, and are much used for making jelly and tarts; they are also eaten in Devonshire raw with clotted cream. The juice of the berries mixed with the powdered bark of alder and alum is employed by the women of northern Russia to dye their hair bright red. A kind of spirituous liquor is also made from them in Germany. The Bog Whortleberry, or Great Bilberry (*V. uliginosum*), is common in the northern parts of Britain, and in the north of Europe and Asia. It is said to cover extensive tracts in Greenland. It grows in marshy situations, and is a taller plant than the common whortleberry. It has deciduous, obovate, entire leaves, and a fruit larger than the common whortleberry, and inferior to it in flavour. The fruit is said to cause giddiness when eaten in large quantity, and an intoxicating liquor is made from it. The Red Whortleberry (*V. Vitis-idæa*), the Preisselbeere of the Germans, is found on dry barren moors in Scotland (called Cranberry in the north; but see CRANBERRY), in northern Europe, and America. The berries, dark red in colour, are acid, somewhat austere, and not so agreeable as the bilberry; yet they make an excellent jelly, which is esteemed for sore throats, and is much used by the Swedes as an accompaniment to venison and other roast meats. Many species of Vaccinium are in occasional cultivation as ornamental shrubs, and the fruit of most of them is agreeable, although in general it wants acidity. Huckleberry, a name of the Gaylussacia shrubs of North America, is sometimes given to the whortleberry, as is also Cowberry.

Whortleberry (*Vaccinium Myrtillus*).

Whydah. or WHIDAH. See DAHOMEY.

Whydah Bird, or WIDOW BIRD (*Vidua*), a genus of African birds in the group of Weavers, remarkable for the elongation of the tail feathers of the males at the breeding season and for the soaring then exhibited. To the length of the tail-train and its frequently black colour the name widow-bird refers, though some say it is a corruption of a West African place-name Whydah. In the largest species *V. procne* the cock's tail feathers are simply elongated; in *V. paradisea*, which is about the size of a sparrow, the middle pair of feathers have the webs greatly widened,

the inferior surfaces twisted round so as to be vertically opposed, and the tips drawn out into a hair-like filament, while the next pair are about a foot long, curved like a sickle, and have a long hair-like filament running along the margin of the outer web, and separated off when the feather is full-grown; in *V. principalis* the two middle pairs form a sort of cylinder. The long feathers of the males drop off after the breeding-season. Widow-birds are sometimes imported as cage-birds on account of the peculiar plumage and pleasant song. See Newton's *Dictionary of Birds*.

Whymper, EDWARD (1840–1911), wood-engraver and traveller, was born in London, and was the son of an engraver and artist. Trained an artist on wood, he became even more famous for his mountaineering than for his book-illustrations. In 1860–69 he scaled several hitherto unscaled peaks of the Alps, including the Matterhorn (q.v.). In 1867 he made valuable geological discoveries in Northern Greenland, and again in 1872. His memorable travels in the high Andes (including the ascent of Chimborazo and other peaks) took place in 1879–80. See his *Scrambles amongst the Alps* (1871; new ed. 1893); his *Travels amongst the Great Andes of the Equator* (with Appendices, 2 vols. 1892); and *Zermatt and the Matterhorn* (1897).

Whyte, ALEXANDER, D.D. (1837–1921), born of humble parents at Kirriemuir, and educated at Aberdeen University and the New College in Edinburgh, became minister of St George's United Free Church, Edinburgh in 1870, Moderator in 1878, and, in 1909, Principal of the New College. Minister rather in the spiritual and mystical side of religion than the controversial, he wrote on Behmen, Bunyan, Law, Rutherford, Andrewes, Santa Teresa, Father John of St Petersburg, Sir Thomas Brown, Newman, Bishop Butler, besides volumes of sermons.

Whyte-Melville, GEORGE JOHN (1821–78), sporting novelist, was born at Mount-Melville, near St Andrews, the son of a Fifeshire laird. He was educated at Eton; in 1839 entered the Coldstream Guards; retired in 1849; but during the Crimean war joined the cavalry of the Turkish contingent (1855–56). From 1850 onwards he published upwards of a score of novels, four or five of them historical, but the best devoted to fox-hunting, steeplechasing, and country-house life generally. He met his death in the hunting-field. See Sadleir, *Excursions in Victorian Bibliography* (1922).

Wiborg. See VIBORG.

Wichita, a city of southern Kansas, capital of Sedgwick county, on the left bank of the Arkansas River, 228 miles SW. of Kansas City. It is an important railway and distributing centre, and is in the midst of a rich agricultural district. It has large iron and machine works, stock and lumber yards, flour mills and manufactories of agricultural implements. Four denominational colleges are situated here. Pop. (1880) 4911; (1900) 24,671; (1920) 72,217.

Wichita Falls, a city of Texas, on the Wichita River, 102 miles NW. of Fort Worth, with machine shops, manufactures of glass, &c. Stock raising and agriculture (wheat, cotton) are carried on in the neighbourhood, and there are petroleum wells. Pop. (1900) 2480; (1920) 40,079.

Wick, the county town of Caithness, on the Wick River, at its entrance to Wick Bay, 161 miles by rail (1874) NNE. of Inverness. The royal burgh has since 1902 included Louisburgh, which lies north of the river, and Pultneytown, a settlement (1808) of the British Fisheries Society, on the south bank. The tidal harbour has accommodation for vessels of light draught and a large fleet of fishing-boats. Wick is one of the great centres of the herring-fishery. Cloth and furniture are also made, and there is an extensive distillery and brewery in Pultneytown. Coal and salt are the chief imports, and salt-herrings, oats, and live-stock are exported. Wick was, till 1918, one of a group of parliamentary burghs. Pop. (1841) 5522; (1921) 8115.

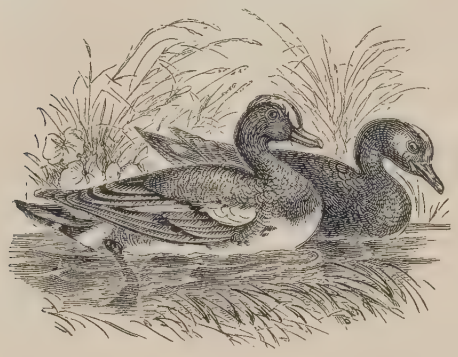
Wick. See LAMPS, CANDLE.

Wicklow, a maritime county of the Irish province of Leinster, borders on Dublin, Carlow, Kildare, and Wexford. Its greatest length is 40 miles, and greatest breadth 33; the total area being 499,958 acres. The coast-line, in many parts precipitous, is obstructed by sandbanks, and very dangerous for shipping. The surface ascends in some parts most abruptly from the sea, and a large portion is mountainous and unproductive. The Wicklow Mountains form rather a group than a range; the highest point is Lugnaquilla (3039 feet), and the glens which lie between the several mountains or groups are exceedingly picturesque, especially Glendalough, Glenmalure, Glen-Imail, the Glen of the Downs, and Ovoca. The valleys are for the most part of limited extent; but some plains of considerable size lie upon the eastern and southern shores. The lakes, although strikingly beautiful, are few in number and of small size; and the rivers are little more than mountain-streams, except the Liffey and the Slaney, which rise in Wicklow. The great central group of mountains is a mass of granite, which protrudes through mica and clay slate. Lead, copper, sulphur, and iron are raised, with some silver; and gold in small quantities has been found. Slates, limestone, and marl are likewise wrought. In the mountains the soil is thin and poor, but generally dry, although there is a considerable proportion of bog. In the valleys and level districts the subsoil is generally gravel, and the soil is for the most part either dry or, even in the boggy districts, susceptible of drainage. Throughout the greater part of the county the occupations of the people are purely agricultural. The fisheries are almost wholly neglected; and the manufacture of flannels, once extensive, is now nearly extinct. The county is divided into eight baronies. The principal towns are Wicklow, the capital, part of Bray, Rathdrum, and Arklow. Pop. (1841) 126,162; (1861) 86,479; (1881) 70,386; (1901) 60,824; (1911) 60,711, of whom 47,999 were Roman Catholics; (1926) 57,583. At the invasion the greater part of Wicklow was granted to Maurice Fitzgerald. Generally speaking, however, the authority of the English in Wicklow was little more than nominal, the territory being under the command of the chief of the O'Byrnes with some rivalry from the O'Tooles. A vigorous effort was made by the Lord-deputy, Sir Arthur Chichester, to establish the king's authority in Wicklow, and in 1605 it was erected into a separate county; but again in 1641 the population joined in the general uprising. During the rebellion of 1798 Wicklow was the scene of more than one conflict. Wicklow possesses few antiquities of the highest interest; there are a number of raths, and some cromlechs, and ogham stones; but apart from sites of ancient cells and churches by far the most important remains of antiquity are the churches and round tower of Glendalough, dating from the 7th to the 12th century. There are also remains of mediæval castles at Newcastle, Wicklow, Rathdrum, and elsewhere, and of a Franciscan friary at Wicklow.—The county town, WICKLOW, stands at the mouth of the Vartry, 28 miles ESE. of Dublin by rail. As a seaport it has but small trade, though it attracts visitors for sea-bathing. Pop. 3000.

Wicliffe. See WYCLIFFE.

Widdin. See VIDIN.

Widgeon (*Mareca*), a genus of Ducks having the bill shorter than the head, the legs short, the feet rather small, the wings long and pointed, and the tail wedge-shaped. The species are numerous and very widely distributed. The Common Widgeon (*M. penelope*) breeds in the northern counties of Scotland, and is very abundant during winter in many parts of the British Islands. It feeds chiefly on grass and vegetable matter. The note is a shrill whistle, which has gained for



Widgeon, Male and Female (*Mareca penelope*).

the species its common names of Whew-duck and Whewer. The American Widgeon (*M. americana*), a slightly larger species than the foregoing, is abundant throughout the colder parts of North America. Its flesh, like that of the common widgeon, is highly esteemed for food.

Widnes, a municipal borough of Lancashire, on the Mersey, 13 miles SE. of Liverpool by rail, with manufactories of alkali, chemicals, and soap, and iron foundries. The population, about 2000 in 1851, was 38,879 in 1921. Widnes, incorporated a borough in 1892, is connected with Runcorn on the other side of the Mersey by a transporter bridge.

Widor, CHARLES MARIE, French composer and organist, was born at Lyons in 1845, and studied under Fétis and Lemmens. In 1870 he was appointed organist of St Sulpice, Paris; and later, at the Paris Conservatoire, professor of organ and then also of composition. He has been permanent secretary of the Académie des Beaux-Arts since 1914. Widor's compositions include operas, symphonies, and chamber music, but he is known chiefly by his works for the organ, on which instrument he is an able performer. He also published *La Technique de l'orchestre Moderne* (1904; new ed. 1920).

Widow, by English law, has rights of some importance in her husband's property. She was entitled to dower—i.e. to a life estate in one-third of his lands; the Dower Act of 1833 extended this right to equitable estates, but by the same act great facilities were given for barring the widow's claim. Dower, however, has no place in the new code of intestacy; and, as regards the estate of every person dying after 1925, the Administration of Estates Act, 1925, abolishes dower and every other estate and interest of a wife in real estate as to which her husband dies intestate, whether arising under the general law or by custom or otherwise. The whole of the real and personal estate of a deceased intestate is to be held by the personal representatives on trust (except as to money) for sale, and, although deprived of dower, the widow gets a substantial right to share in the money and the proceeds of sale. For the rights of a widow in Scotland, see articles DEAD'S PART, HUSBAND AND WIFE, JOINTURE. In the United States a widow usually takes one-third of her husband's personalty not disposed of, and one-third or more of his real estate, but the laws of the different states vary widely on this point; see Stimson's *American Statute Law*. See SUTTEE.

Widow Bird. See WHYDAH BIRD.

Widsíth, a specimen of the heroic poetry of 7th century England, preserved in the West Saxon dialect of the 10th century, is professedly the experience of the wandering scop Widsíth ('far-traveller') at the courts of the old Germanic kings, including the Gothic Ermanaric and the Burgundian Gundhari. It is probably not historical or autobiographical, but poetic invention. It has, indeed, some chronological impossibilities. See the edition and translation by R. W. Chambers (1913).

Wieland, CHRISTOPH MARTIN, the son of a Swabian pastor, born near Biberach on 5th September 1733, brought up in the tenets of pietism and influenced strongly by Klopstock, early produced religious poetry. Bodmer (q.v.) invited him (1752) to Zürich and inspired him to write *Der geprüfte Abraham* and other poems full of exaggerated sentimentality and religious mysticism. But the native bent of Wieland's disposition was towards the exactly opposite direction, and began to show itself even before he left (1760) Switzerland to take up an official position in his native town. During the next nine years he was chiefly influenced by French writers such as Voltaire and Rousseau and by the society of Count Stadion, a thorough man of the world, and of the beloved of his youth, Sophie von Laroche, now, however, married; in this period, besides making the first German translation of Shakespeare's plays (8 vols. 1762–66), he wrote the romances *Agathon* and *Don Silvio von Rosalva*, *Die Grazien* and other tales, the didactic poem *Musarion*, &c., books in which he advocates taking a full enjoyment of the good things of this life, sometimes in a sense that oversteps the bounds of decent license. The easy and elegant style, the grace and lightness of treatment, and doubtless the strong flavour of the current of French materialism that mark these productions made Wieland the most popular author of his day with fashionable society, who hitherto had read nothing but French literature. After holding for three years a professorship at Erfurt, Wieland was called to Weimar to train the sons of the grand-duchess, and there he spent most of the rest of his life, living on a good pension from the grand-duke and enjoying in his later years the friendship of Goethe and the acquaintance of Herder. He lived to a green old age and died, still hale and cheery of spirit, on 20th January 1813. The chief fruits of his literary activity during this Weimar period were the heroic poem *Oberon*, his best and most popular work, and that by which he is best remembered; the historical romances *Die Abderiten*, *Aristipp*, &c., the elegant satire of which is perhaps their principal charm; the graceful narratives in verse entitled *Auserlesene Gedichte* (1784–87); German versions of Lucian, Horace, and Cicero's *Letters;* and the editing of the magazines *Der Teutsche Merkur* (1773–89), *Attisches Museum* (1796–1801), and *Neues Attisches Museum* (1802–10).

Wieland's *Werke* were published in 1818–28 (53 vols.), and in 1879–82 (40 vols.); selections in 1887 and 1889. See Life by Gruber (4 vols. 1827–28), and besides his Letters, books by Ofterdinger, Büchner, Keil, Hirzel (1891); also Budde, *Wieland und Bodmer* (1910); Stadler, *Wieland's Shakespeare* (1910).

Wieliczka, a small town of Western Galicia, 10 miles SE. of Cracow by rail, remarkable for its extensive salt-mines (see SALT); pop. 6000.

Wien. See VIENNA.

Wiener-Neustadt, a town of Lower Austria, 30 miles S. of Vienna, containing a castle (12th century), a museum of antiquities, and a Gothic church. There are manufactures of machinery, leather, &c. The town was largely rebuilt after the great fire of 1834. Pop. (1923) 36,956.

Wieniawski, the name of two brothers born at Lublin in Poland, distinguished both as playes and as composers. The elder, HENRI, violinist (1835–80), studied at Paris, was for twelve years solo-violinist to the tsar, and for a time taught at the Conservatoire in Brussels, besides giving concerts in many lands, including America. He left many compositions for the violin.—JOSEPH, pianist (1837–1912), studied at Paris and Berlin, taught in the Conservatorium at Moscow, held a conductor's post at Warsaw from 1871 till 1877, when he resumed solo playing.

Wier, JOHANN, one of the first opponents of the witchcraft superstition, was born in 1516 at Grave in North Brabant, studied medicine at Paris and Orleans, and settled about 1545 as a physician at Arnhem, whence he was called to Düsseldorf to be body-physician to Wilhelm IV., Duke of Jülich, Cleve, and Berg. To him he dedicated his famous treatise, *De præstigiis dæmonum et incantationibus ac veneficiis* (Basel, 1563), a plea addressed to the duke and all princes against the folly and cruelty of the witchcraft trials. The book pleased Duke Wilhelm, but roused the fury of the clergy. It still stands in the *Index*, but it has given its author a name to be remembered among the benefactors of humanity. The duke protected him till his death on a journey in Secklenburg, 24th February 1588. Wier was a Protestant, and had been a pupil of Cornelius Agrippa, and so his respect for authority was naturally weakened; but it cannot be said that his scepticism is audacious. Still, as Lowell says, he insinuates much more than he positively affirms or denies, and most probably he went as far as he dared, feeling that to go further would damage his case. His famous treatise was followed by *De Lamiis*, and by the *Pseudomonarchia Dæmonum*, a description of the hierarchy of Hell, 'with the names and surnames,' says his indignant antagonist Bodin, 'of seventy-two princes, and of seven million four hundred and five thousand nine hundred and twenty-six devils, errors excepted.' Bodin no doubt felt that the real object was to make the whole thing ridiculous, hence his anger at a writer who 'had armed himself against God' and concocted a tissue of 'horrible blasphemies.' See study by R. Binz (Bonn, 1885).

Wiertz, ANTON JOSEPH, painter, was born at Dinant, 22d February 1806, and studied at Antwerp and Rome. In 1836 he settled in Liége, and in 1848 at Brussels, where he died 18th June 1865. His original artistic ideal was to combine the excellences of Michelangelo and Rubens; and his efforts in this direction are visible in his pictures of 'The Fight of Greeks and Trojans round the Dead Body of Patroclus,' 'The Disobedient Angels,' 'The Death of St Denis,' 'Eve and Satan,' 'The Flight into Egypt,' and 'The Triumph of Christ'—some of them very large canvases. As he could not persuade himself to sell such pictures, he maintained himself now and later by painting portraits. About 1848–50 he developed a new technical method which he called *Peinture Mate;* and now he began to paint totally different subjects—speculative and mystical pieces, dreams and visions, and the horrible outcome of a morbid imagination—premature burial, suicide, madness, execution, sensations after death. There were genre pictures also which were only eccentric—'Quasimodo,' 'The Young Witch;' and even pleasing and kindly pictures—'The Maid at her Toilet,' 'The Confession;' and he also left some sculptures. In 1850 the state had built for him a large studio in Brussels, and at his death this became, by an arrangement between the state and his heirs, the Musée Wiertz, one of the sights of the city. There are monographs by Labarre (1866) and Claessens (1883).

Wiesbaden, chief town of a Prussian district in the province of Hesse-Nassau, was formerly capital of the independent duchy of Nassau. One of the oldest and most famous of the German watering-places, it is delightfully situated on the south slopes of Mount Taunus, and 6 miles NW. of Mainz by rail. The town has been called 'a city of lodging-houses,' and this may be understood from the fact that during the 'season' the number of the visitors is almost as large as that of the resident inhabitants. The principal points of interest are the palace (1840); the imposing Kurhaus (1905–7), with concert halls, &c.; the Kurpark with delightful gardens; the town-hall (1888); the New Museum (1913–15), containing the municipal picture gallery, the Nassau museum of antiquities, and the natural history museum; the Nassau State Library with over 200,000 books; the State theatre (1892–94); the handsome Protestant church (1853–62); the superb Greek chapel (1855), built by the Duke of Nassau as a mausoleum for his duchess. There are some thirty hot springs; but the principal is the *Kochbrunnen* ('Boiling spring'), the temperature of which is 150° F. The spring has all the appearance of a boiling caldron, and yields some 5000 gallons an hour. Next in heat and volume to the *Kochbrunnen* is the spring that rises in the garden of the *Adler* ('Eagle') Hotel, the temperature of which is 140° F. The use of the Wiesbaden hot-springs is considered highly efficacious in cases of gout, rheumatism, nervous affections, and intestinal complaints. The waters of these springs are saline, and contain silica and iron. The prosperity of Wiesbaden is entirely due to its springs. Its mild climate, the beauty of its situation and environment, the agreeable walks and rides, and the never-failing gaiety that prevails during the season render it one of the most popular of the spas. Though the public gaming-tables were abolished in 1872, the number of visitors annually is about 60,000; some 5000 or 6000 strangers winter here annually. Pop. (1871) 35,463; (1900) 86,111; (1925) 102,557. Wiesbaden is very ancient; its springs were known to the Romans, who built a station here and erected a fort. Many Roman remains have been dug up here and in the neighbourhood. After the Great War it was occupied by the Allies.

Wiesen, a Swiss health-resort for the weak-chested, is 4771 feet above the sea-level, and 12½ miles SW. of Davos.

Wieser, FRIEDRICH VON, one of the leading economists of the 'Austrian School' (see POLITICAL ECONOMY), was born at Vienna on 10th July 1851. After attending Vienna university, where he evinced an aptitude for the study of history and economics, he spent a time in the finance department of the Austrian government, but later turned back to economic studies and became professor first in Prague then in Vienna (1903). From 1917 to 1919 he served as Minister of Commerce, but returned once more to university teaching till 1922. He died 23d July 1926. Wieser, whose development of Menger's theory of value made him a leading figure in European economics of his day,

drew attention to himself in 1884 by his publication of *Ursprung und Hauptgesetze des wirtschaftlichen Wertes*, followed in 1889 by *Der natürliche Wert* (English translation 1893). Worthy of note also are his *Österreichs Ende* (1917), and his article on the 'Austrian School' in Palgrave's *Dictionary of Political Economy*.

Wife. See HUSBAND AND WIFE, MARRIAGE, WEDDING-CEREMONIES, WIDOW.

Wiffen, BENJAMIN BARRON (1794–1867), was born at Woburn, Bedfordshire, of Quaker parentage, and devoted himself to the editing and reprinting of the writings of early Spanish Reformers, his works (1848–69) numbering twenty-nine, and his valuable collections being now in the library of Wadham College, Oxford.—His brother, JEREMIAH HOLME WIFFEN (1792–1836), librarian to the Duke of Bedford at Woburn Abbey, translated Garcilaso de la Vega, Tasso, &c.

Wig, a contracted form of *periwig*, which is a modification (through the Dutch) of *peruke*, from Fr. *perruque;* other Romance forms are *peluca* and *piluca*, and all of them are from Lat. *pilus*, 'a hair.' Wigs were in use from the earliest times, not merely to cover baldness, but, like elaborate coiffures of the natural hair (see HAIR-DRESSING), to add to the dignity or formidableness of savages. Wigs are found on Egyptian mummies, and are indicated in Assyrian sculptures, and passed from Persians, Medes, Lydians, and Carians to Greeks and Romans. But the wig-making and wig-wearing as known to moderns originated in France, and the palmy days of wigs were in the 17th and early 18th centuries. Originally more or less an attempt to reproduce an exceptionally fine head of hair, wigs became in the *allonge* perruque huge masses of hair that, falling down on the shoulders, were parted into two groups or bunches of ringlets, one on each breast. Louis XIV. wore a wig till then of unparalleled size. The English full-dress wig of Queen Anne's time was similar; and this cumbrous type survives in the full-dress full-bottomed wig of English judges, which has flaps of twenty or more rows of stiff and formal curls hanging down in front. The smaller and more ordinary tie-wig (in which the lower part of the wig was tied) is fairly represented by the judge's undress wig and the barrister's or advocate's frizzed wig. Another form was the bag-wig—the lower part of the wig being tucked into a silken bag on the shoulders. The serjeant's Coif (q.v.) is extinct. When the wearing of wigs was fully established small boys of the well-to-do classes went to school in wigs and cocked-hats. In the early part of George III.'s reign it became more and more usual for private persons to do without wigs, wearing their own hair powdered and tied or looped up like a wig; professional men, especially doctors, stuck longer to them. Just before the French Revolution, which dealt the final death-blow to wig-wearing, a gentleman's wig would cost from 30 to 40 guineas. It should be noted that in France the Catholic Church had resolutely but in vain opposed itself to the introduction of the custom. Bishop Blomfield was the first bishop who set the example of wearing his own hair; Archbishop Sumner still wore a wig at the wedding of the Princess Royal of England in 1858. Professional wigs are now only worn by the Speaker of the House of Commons (a full-bottomed one), judges, and barristers; and a wig is part of the livery of some coachmen. Such wigs are made of white horse-hair, laboriously cleaned, curled, and woven on silk threads, and fitted. Wigs to supply natural deficiency of hair are of course made of human hair. Stage-wigs are often made of jute. See FASHION, HAIR-DRESSING.

Wigan, a municipal, parliamentary, and county borough of Lancashire, on the Douglas (a feeder of the Ribble's estuary), 15½ miles S. by E. of Preston, 18½ miles NE. of Liverpool, and 18 miles WNW. of Manchester; and on the L.M.S. main railway line to Carlisle and Scotland. An ancient town identified with the Roman station of Coccium, it was in early times a borough by prescription and later made a free borough by Henry III. (1246). Its privileges were confirmed and extended by subsequent monarchs, the charters of Edward II., Elizabeth, Charles II., and James II. being still preserved in the public library. Wigan returned two members to parliament from 1295 to 1885, and thereafter one. It has held a court of quarter sessions, with a recorder, from the 16th century. All Saints' Parish Church, a Norman foundation, is a stately edifice dating from the 14th century, though practically rebuilt by sections between 1845 and 1849; the tower, considered to be the original Norman fabric was refaced for the first time in 1922. The earliest known rector is one Ranulph, who was in office in 1199, since which time the succession is unbroken, the list embracing a number of famous names, including John Maunsell (a minister of Henry III.), Thomas Linacre (founder of the Royal College of Physicians), John Bridgeman (Bishop of Chester), and bishops John Pearson and John Wilkins. In 1323 Edward II. stayed a week at the neighbouring priory of Upholland, and visited the town to preside over a special court held in Wigan to inquire into the disturbances in the county from the beginning of his reign. During the Civil War Wigan was an important Royalist centre, but it was twice taken by the Parliamentarians, Sir John Seaton inflicting a severe defeat on the Earl of Derby in 1643, who was again defeated by Colonel Lilburn in 1651. Oliver Cromwell lodged in the town in 1648 whilst pursuing the Scottish army under the Duke of Hamilton. The town suffered severely from the threefold scourge of the sword, pestilence, and famine, a petition after the war was over stating that it had been seven times plundered. Prince Charles Edward, 'the Young Pretender,' passed through Wigan in 1745 on his way to Manchester; and afterwards, retreating, slept the night in the old Manor House, Bishopgate, the Duke of Cumberland occupying the same quarters on the following day. A relic of the 12th century is Mab's Cross in Standishgate, bearing witness to the legend which Scott made the basis of *The Bethrothed*.

Pottery and pewter were important industries in the 16th and 17th centuries, and John Dwight, founder of the Fulham Pottery, was a resident between 1662 and 1687. Bell-founding was also important throughout the 16th and 17th centuries, the existing church bells of many Lancashire and North Wales towns being cast in Wigan. Cotton and iron are also ancient industries, but the town owes its present position to the exploitation of the rich Lancashire coalfield of which it is the centre. Though the distinguishing pit-head gears are no longer a feature of the borough area, nearly one-tenth of the population is still directly employed in the coal industry. The present manufactures include calicoes, ginghams, table-cloths, fustians, linens, tweeds, ready-made clothing, slippers, ladies' and children's shoes, roofing felts, iron, naval castings, motor vehicles, mining plant, chemicals, explosives, &c., some of its cotton-mills and ironworks being amongst the largest in the kingdom. The largest mine-ventilating shaft in the world was made here for Johannesburg in 1924.

The town became a county borough in 1888. Pop. (1831) 20,774; (1881) 48,194; (1901) 60,770; (1911) 89,447; (1921) 91,200. Pop. of the Wigan

union area (1921) 209,764. The most notable institutions are the Public Library (by Alfred Waterhouse, R.A., 1878) and the Mining and Technical College. The Public Reference Library contains a collection of incunabula, illuminated manuscripts, fine bindings, a rare set of De Bry's Voyages, an unrivalled mining collection, and many bibliographical rarities. The Mining and Technical College founded in 1857 moved to its present handsome and extensive premises in 1903. Other institutions and buildings are the grammar-school (1596, rebuilt by Waterhouse 1876), town-hall (1866), market-hall (1877), infirmary (1873, enlarged 1884 and 1924), baths (1882), county buildings (1888 and 1901), girls' high school (1916), municipal buildings, and a public park (1878) of 30 acres. The Haigh Plantations, a beautifully wooded region striding the Douglas Valley and extending over 100 acres, are thrown open to the public by the Earl of Crawford to whose residence at Haigh they form the approach. Considerable effort has been made in recent years to improve the town.

The most eminent natives are Ralph Brooke, York herald (1553–1625); Henry Mason, divine and benefactor (1573–1647); John Leland, nonconformist divine (1691–1766); Henry Bromly, art critic (1750–1827); William Roby, nonconformist divine (1766–1830); William Atherton, nonconformist divine (1775–1850); John Fairclough, Jesuit writer (1787–1832); Edward Cardwell, church historian (1787–1861); John Roby, poet (1795–1850); John Critchley Prince, minor poet (1808–66); John Howard Marsden, antiquary (1803–91); John Fitchett Marsh, antiquary (1818–80); Sir John Scott, Egyptian administrator (1841–1904); Peter Wallwork Lathom, medical scientist (1832–1923). Eleanor Robson (Mrs August Belmont), the distinguished American actress, was also born at Wigan, and the famous Duchess of St Albans (1787–1870) was brought up in the town.

See Sinclair's *History of Wigan* (2 vols. 1882), Bridgeman's *History of the Church and Manor of Wigan* (4 vols. 1888–90), and John Roby's *Traditions of Lancashire* (various editions).

Wiggin, Kate Douglas (1857–1923), American writer, was born at Philadelphia, and took up Kindergarten work before devoting herself wholly to writing. *Penelope's Experiences* in England (1893), Scotland (1898), and Ireland (1901) respectively are amusing tourist fiction, while *Rebecca of Sunnybrook Farm* (1903) and *New Chronicles of Rebecca* deal charmingly with New England life. She also wrote on Froebel and Kindergarten.

Wight, The Isle of, with the exception of the Isle of Man the largest island in the English seas, lies off the southern coast of the kingdom, separated from Hampshire by the Solent, a channel mainly ranging between 2 and 4 miles in breadth, but only a mile in width on the west, between Hurst Castle and Cliff End, while it expands to 7 miles between Southsea and the Foreland on the east. In shape Wight is an elongated rhomboid, and the outline has been fancifully likened to that of a turbot. Its extreme length, east to west from the Foreland to the Needles, is about 23 miles, and its extreme breadth, north to south, Cowes to St Catharine's Point, is about 13 miles. The area is calculated at 145 sq. m., or 92,931 acres, but was formerly estimated at much more. A bold range of chalk downs runs somewhat irregularly east and west the entire length of the island, terminating on the west in the fine isolated peaks of the Needles —so well known in the navigation of the Channel, and especially in connection with the port of Southampton—and breaking off on the east at Culver and Bembridge. These downs at several points reach from 500 to 700 feet; but they are excelled in altitude by the high land on the extreme south or 'back' of the island, where St Boniface Down above Ventnor attains 787 feet. This is the highest point of the isle, though St Catharine's Beacon to the westward is only half-a-dozen feet less. The more elevated ground being thus on the south, the chief streams flow to the north, and three of them traverse nearly the whole breadth. Thus the eastern Yar rises on St Catharine's Hill, and falls into a landlocked lake-like estuary at Brading, partially cutting off a peninsular region on the east, known as the Isle of Bembridge. The chief river of the island, the Medina, also rises at St Catharine's, and runs directly northward to the Solent at Cowes. In its course it divides Wight into two fairly equal parts —east and west Medina. Towards the western extremity is another Yar, which rises within a short distance of the southern coast cliffs, and has its embouchure at Yarmouth. This peninsulates a bold district known as the Isle of Freshwater. Smaller streams flow northward to a many-branched tidal inlet at Newtown; and another finds its way through the Wootton Creek between Cowes and Ryde. The streams which flow southward are unimportant so far as size is concerned, and their courses are short, but they play an important part in specialising the characteristics of the island by the formation of 'chines,' narrow ravines worn through the soft rocks by which they pass into the sea—Blackgang the most weird, and Shanklin the most romantic. The geology teems with interest, ranging from the Wealden to the Eocene, and fossiliferous localities of the greatest importance are numerous. The strata form an ascending series generally from south to north. The Wealden beds appear on the south-west coast, chiefly between Atherfield and Compton Bay, where the Wealdens join the Upper and Lower Greensand, Gault, and Chalk, as also at Redcliff Bay near Sandown. The Lower Greensand and Gault extend generally from Atherfield to St Catharine's Point, and from Bonchurch to Sandown. Northward lies the Chalk, chiefly to be noted at Freshwater and Culver. In the remaining portion of the area Oligocene and Eocene beds are finely and characteristically developed. Headon Hill and Alum Bay (long noted likewise for its variegated cliff sands) are the best localities for studying these strata generally, while there are also noteworthy fossiliferous fresh-water deposits, as at Binstead. The flora of the island is rich, especially in chalk and seaside plants; and marine algæ are plentiful.

Wight has long been in repute for the mildness of its climate and the productiveness of its soil; and the former of these features, in conjunction with the picturesque variety and exceeding charm of its landscapes, and the ever-changeful attractions of its romantic coast-line have made it one of the best known of modern seaside centres. It claims some special attention for each of its favourite resorts. Ventnor, best known of all, is delightfully seated in the heart of the singularly beautiful scenery of the rugged Undercliff, a picturesquely broken belt of shifted land between cliff and sea. Sandown boasts a long stretch of beach, and Freshwater is the centre of the finest rock scenery. But of late years almost every village near the coast has laid itself out for the reception of visitors, and creeks and bays are dotted with hotels. Of ordinary trade there is comparatively little, though there is a fair amount of yacht-building at Cowes, which maintains its position as one of the chief yachting centres of the world. Railways traverse the island between Ryde and Ventnor, with a branch to Bembridge; and

there are lines from both Ventnor and Ryde to Newport, and from Newport respectively to Yarmouth and Freshwater, and to Cowes. Ryde has a fine pier. Wight came the more into favour from the fact that it was chosen by Queen Victoria as the seat of her marine residence at Osborne, afterwards turned into a naval college (see COWES, NAVY). Farringford, near Freshwater, was the favourite residence of Lord Tennyson. Parkhurst Forest, once a royal hunting ground, and of some value as a source of timber for the navy, is now a pleasant tract of woodland, but of little utilitarian importance.

There are yet traces on the downs, in barrows and cairns, of the earlier inhabitants of the island, but its history really begins with its conquest by Vespasian in 43 A.D. as *Insula Vectis*. From this name it has been suggested that it may have been the *Iktis* of Diodorus Siculus, to which the British tin was brought in carts at low tide, but apart from other difficulties there is no evidence that the Solent could ever have been fordable in the historic period. There is, however, ample evidence that the island was well appreciated by the Romans. In all probability they had their chief station at Carisbrooke, the central stronghold, and in that village still exist the remains of a small Roman villa. The foundations of a Roman building of much more importance were discovered in 1880 at Morton, near Brading, the pavements of which are remarkably fine. Cerdic is said to have reduced the island in 530; but it did not fall definitely under Saxon rule until later. After the Norman Conquest it was given to William Fitzosborne, but was forfeited by his son, and passed to the Redvers family, who thence took the title of 'lords of the isle.' Baldwin de Redvers, second Earl of Devon, founded there the Cistercian abbey of Quarr, of which a few traces still remain; and in the House of Redvers Wight remained until the death in 1292 of Isabella de Fortibus, *domina insulæ*, when it passed to the crown. Carisbrooke Castle, the most important relic of antiquity in the island, is mainly connected with these Redverses. Norman work may be traced, but the chief portions of the older masonry were executed by the Earls of Devon of this line, one of whom made the famous well, from which water is still raised as of old time by a donkey working in a wheel. The castle was strengthened at the time of the Armada, and it became the prison of Charles I. for some months shortly preceding his execution. In 1650 his younger children were sent hither, and here died the Princess Elizabeth, a monument to whom by Marochetti was placed by Queen Victoria in Newport Church. Carisbrooke was the official residence of the governor of the island, which has long been a titular office merely; and it has been for many years a ruin. There are, however, several government establishments, as at Parkhurst, and sundry forts connected with the defences of Portsmouth and Spithead. Before 1832 Wight returned six members to parliament, two for Newport, two for Yarmouth, and two for Newtown, the actual site of which had then no inhabitants. Yarmouth and Newtown were disfranchised, and a county member given to the Isle, which had previously ranked under Hampshire. Now it has no parliamentary borough, and one member for the island only; but it has become an administrative county under the County Councils Act, 1888. Pop. (1881) 73,633; (1921) 94,697. The capital is Newport (11,036), while the only other municipal borough is Ryde (11,295). The populations are largely increased during the tourist season.

See the works cited at HAMPSHIRE; also Histories of the Isle of Wight by Worsley (1781), Lockhart (1869); general descriptions by Englefield (1816), White (1859), Cornish (1895); books on the flora by Townsend (1883), on the churches by Cox (1911), on the geology by White (1921), Hughes (1922). For map, see PORTSMOUTH.

Wigton, a market-town of Cumberland, in the midst of a specially agricultural district, 11¼ miles by rail SW. of Carlisle. It carries on manufactures of clothing and leather goods. Pop. (1921) 3656.

Wigtown, a county forming the south-west corner of Scotland, the western part of Galloway, bounded on the W. by the Irish Channel, N. by Ayrshire, E. by the Stewartry of Kirkcudbright and the Solway Firth, and S. by the Irish Sea. Its length from east to west is 30 miles, its breadth from north to south 28 miles. Area, 311,984 acres; pop. (1851) 43,389; (1921) 30,783. Wigtownshire is deeply intersected by two arms of the sea, the narrow inlet Loch Ryan (q.v.) in its north-western corner, and Luce Bay on the south, 16 miles long, 18¾ wide at its mouth, as measured from the Mull of Galloway on the west—the southernmost extremity of Scotland—to Borough Head on the east. The western peninsula thus formed, known as the *Rhinns of Galloway*, is 28 miles long from Corsewall point in the north to the Mull of Galloway. The south-eastern portion of the county forms a blunt triangular peninsula—the *Machers*—ending in Borough Head, washed on the west by Luce Bay, on the east by Wigtown Bay, 15 miles long and 14 wide at its mouth, separating it from the Stewartry. The rest of the county north of the Machers and east of Loch Ryan bears the general name of the *Moors*, great part being occupied by bleak fells and high mosses. The surface is diversified, but the only hills that reach 1000 feet are on the northern borders—one solitary peak in the Rhinns, Cairn Piot, reaches a height of 593 feet. The chief streams are the Cree and Bladenoch, emptying into Wigtown Bay, the Luce (formed by the junction of the Cross and Main Waters of Luce) and Piltanton, into Luce Bay. The lakes are very numerous, but small—in one parish alone (Inch) there being no fewer than eleven. The climate is mild, but moist. There are neither minerals nor manufactures, the entire industry being agricultural, about half of the surface arable. Excellent farming has made the most of but indifferent soil, and the dairy farms of the county deserve the reputation they have gained. The cows are frequently let for hire to *bowers* or practical dairymen, who receive the produce in return for a money rent; the farmer supplies the food and dairy utensils, the dairyman the labour. Most of the cows are of the Ayrshire breed; the pure native breed of large black hornless cattle are seldom seen, still less the small Galloway pony formerly so popular. The principal towns and villages are Stranraer, Wigtown, Newton-Stewart, Whithorn, Glenluce, Newluce, Cairn Ryan, Portwilliam, Garlieston, Dromore, Portpatrick, and Lochans.

See W. M'Ilwraith's *Guide to Wigtownshire* (Stranraer, 1876); also the article GALLOWAY, and books enumerated there. For descriptions of the *crannogs* and other lake-dwellings found in Wigtownshire, see Robert Monro in *Ayr and Wigtown Arch. Coll.* (vol. v.), and the Rev. George Wilson in *Proc. Soc. Antiq. Scot.* (vols. ix. and x.). The only ecclesiastical buildings of which ruins remain are the Cistercian abbey of Glenluce (1190) and the old cathedral of Whithorn.

WIGTOWN, the county town, a royal and municipal (and till 1885 parliamentary) burgh and seaport, is situated on the west side of Wigtown Bay, near the mouth of the Bladenoch Water, 7¼ miles S. of Newton-Stewart by rail and 129 SSW. of Edinburgh by road. The only noticeable buildings are the parish church (1853) and the Tudor town-hall (1862–63). In the churchyard are the graves of the famous 'Wigtown martyrs,' an old woman and a young girl who, refusing the Abjura-

tion Oath, were tied to stakes at the mouth of Bladenoch and drowned by the incoming tide, 11th May 1685. An obelisk to their memory also stands on the Windy Hill. An attempt has been made to prove that this atrocious sentence was never executed, as a recommendation to pardon stands in the Privy-council registers, but the fact that the sentence was carried out before this remission was conveyed to Wigtown may be considered to be proved as satisfactorily as any question of its kind can be by the Rev. Dr A. Stewart's *History Vindicated* (2d ed. 1869), in answer to Mark Napier's *Case for the Crown* (1863). Wigtown has a little shipping, and at Bladenoch Bridge there is a distillery. Pop. 1300.

Wigwam. See TENT.

Wilamowitz-Möllendorff, ULRICH VON, philologist and classical scholar, was born at Markowitz, Posen, in 1848, studied at Bonn and Berlin, and finally in 1897 became professor of Ancient Philology at Berlin. His works include *Aristoteles und Athen* (1893), *Bakchylides* (1898), *Sappho und Simonides* (1913), *Ilias und Homer* (1916), *Platon* (1918), *Griechische Verskunst* (1921), *Hellenistische Dichtung* (1924); volumes of addresses (1901; 2 vols. 1915–16); excellent editions of Greek tragedies (3 vols. 1899–1906); important contributions to the *Philologische Untersuchungen* of Kiessling, and to *Die Kultur der Gegenwart* of Hinneberg; and some translations.

Wilberforce, SAMUEL, was born at Clapham, on September 7, 1805, the third son of William Wilberforce, the anti-slavery philanthropist. Of his father's letters to him after his twelfth year 600 are extant, many of them inculcating the duty and solemnity of private prayer. By his father too he was early taught to express himself clearly upon prescribed subjects. In the 'Union' debating society at Oxford, formed just before he entered Oriel College, aged eighteen, he cultivated this habit, so that in after life eloquence was one of his most marked personal gifts. In 1826 he graduated with first-class honours in mathematics and second-class in classics. On June 11, 1828, he married Miss Emily Sargent, whose younger sister married H. E. (afterwards Cardinal) Manning, and through whom he inherited Lavington in Sussex. On December 21 he was ordained curate in sole charge of Checkendon church, near Henley, and in 1830 became rector of Brightstone, Isle of Wight (Bishop Ken's parish 1667–70). His zeal and his thorough sympathetic mastery of his parochial work there soon made him one of the foremost clergymen in the island, of the north-east of which he became rural dean in 1836, and prepared him for the efficient discharge of the important offices to which he was in rapid succession called. A successful tour in Devon and Cornwall in 1839 on behalf of the S.P.G. brought him into further notice, and the same year he became archdeacon of Surrey. In 1840 he was appointed rector of Alverstoke and canon of Winchester, and an anti-slavery speech so impressed the Prince Consort, who was present, that the following year he was made one of the prince's chaplains and preached at court. Before that, however, the great sorrow of his life had befallen him in the death of his wife. In March 1845 he was appointed Dean of Westminster, and in October, on the eve of Newman's reception into the Church of Rome, Bishop of Oxford. Beginning his episcopate at such a crisis, immersed shortly thereafter in the sea of difficulties raised by the promotion of Dr Hampden to the bishopric of Hereford, distressed by the Gorham judgment, involved in the troubles connected with *Essays and Reviews* and Bishop Colenso, in all which controversies he took an active and prominent part; deeply wounded too by the secession to Rome of his three brothers, his only daughter, and his son-in-law, and by the early death of his eldest son, he nevertheless so governed the diocese for twenty-four years as to deservedly earn the title of the 'Remodeller of the Episcopate.' He has been regarded as the representative member of the bench of bishops, almost of the English Church, during the third quarter of the century, and with him the new order of bishops may be said to begin. Watchfulness and work, not pomp and ease, were his characteristics. His confirmations were made opportunities of lasting impressions, his ordinations seasons of true devotional preparation. He instituted Cuddesdon training-college, and he was mainly instrumental in reviving Convocation as a synodical assembly after it had for nearly 150 years been a mere form. He claimed to belong to the school of the old Church of England, opposed alike to 'Puritan sourness and Romanising superstition.' The charm of his many-sided personality, his administrative capacity, his extraordinary power of work, his social gifts as a ready humorist and a brilliant conversationalist, and his gifts as an orator on the platform and in the pulpit, and as a debater in parliament, are universally acknowledged, but the man has been too much lost sight of in the versatile ecclesiastic, the devout Christian in the popular bishop. 'Too clever, too self-reliant . . . too persuasive, too fascinating in manner, too fertile in expedients . . . too facile,' he got the sobriquet of 'Soapy Sam,' but there was truth as well as wit in his own explanation of the name, that it was because 'he was always in hot water, and always came out of it with clean hands.' The tenderness of his family affection, his life-long devotion to the memory of his wife, and the depth and humility of his inner life are touchingly brought out in his too brief diary. He was neither a great theologian nor a voluminous author, but he edited *Letters and Journals of Henry Martyn* (1837), wrote along with his brother the Life of his father (1838), and himself wrote *Agathos* (1839), *Rocky Island* (1840), *History of the American Church* (1844), and contributed to the *Quarterly Review*. In 1869 he was transferred to Winchester, and on 19th July 1873 was suddenly killed by falling from his horse while riding with Earl Granville, near Dorking.—His son, ERNEST ROLAND (1840–1908), was Bishop of Newcastle 1882–95, and then of Chichester. Another son, ALBERT BASIL ORME (1841–1916), was archdeacon of Winchester.

See *Life* (3 vols. 1879–82; vol. i. by Canon Ashwell, ii. and iii. by his son); smaller works on him by the same son (1895 and 1905); *Bishop Wilberforce*, by Daniell (1891); the sketch by Dean Burgon in his *Lives of Twelve Good Men* (1888); and the Life by R. Coupland (1923).

Wilberforce, WILLIAM, abolitionist and philanthropist, was born at Hull on 24th August 1759. His father was a wealthy merchant, descended from an old family, proprietors of Wilberfoss, in the East Riding of York. After a delicate childhood, Wilberforce, at the age of nine, on his father's death, was sent to school at Wimbledon, where, under the care of a pious aunt, he was like to become a Methodist. But his mother did not approve of a serious education, and removed him to a school at Pocklington, Yorkshire, where the religious impressions he had received were soon dissipated by a life of gaiety. His constitution was delicate, but he was quick and spirited, and fond of society, in which his lively conversation and musical talent made him a great favourite. While at school he addressed a letter to a York paper (1773) 'in condemnation of the odious traffic in human flesh,' the removal of which was after-

wards the main object of his life. At seventeen he entered St John's College, Cambridge, and in due time he passed his examinations with credit. He came, on attaining his majority, into possession of a large fortune, and determined to enter parliament. In 1780 he was returned for Hull. He had known Pitt when at Cambridge, made a tour in France with him in 1783, and in London they became inseparable friends. But Wilberforce, in parliament, remained independent of party. The elevation of Pitt to the premiership gave him an opportunity of taking office, but he declined to do so. He rendered, however, efficient service to his friend. In 1784 he was returned to parliament for both Hull and Yorkshire, and took his seat for the county. In 1784–85 Wilberforce made a tour on the Continent with some ladies of his family and Isaac Milner, the Dean of Carlisle, in conversation with whom he became seriously impressed with the truths of the Christian religion, and the rest of his life was leavened with a spirit of earnest piety and devotion. In 1787 he in a great measure eschewed gaiety, and founded an association for the reformation of manners; and in 1788, while in very bad health, he entered on his nineteen years' struggle for the abolition of the slave-trade, to which he thenceforward dedicated his whole time. He was powerfully supported by the Quakers, and by Mr Thomas Clarkson, who kept alive interest in the subject outside the walls of the House of Commons. Pitt, in the absence of Wilberforce through ill-health, introduced the subject to parliament in 1788; in the following year when Wilberforce proposed the abolition of the slave-trade in the House of Commons, he met with powerful opposition, until, after several years of indefatigable labour, the measure for abolition received the royal assent 25th March 1807. Sir Samuel Romilly, who supported the measure, compared the feelings of Napoleon, then at the height of his glory, with those of the English philanthropist, 'who would that day lay his head upon his pillow, and remember that the slave-trade was no more;' and the whole House burst into applause, and greeted Wilberforce with enthusiastic cheers. Wilberforce now sought to secure the abolition of the slave-trade abroad. He at the same time entered on an agitation for the total abolition of slavery itself. Declining health, however, compelled him in 1825 to retire from parliament, in which, since 1812, he had sat for the borough of Bramber. The movement against slavery was then entrusted to Sir T. Fowell Buxton. Three days before Wilberforce's death news was brought him that the Abolition Bill had passed a second reading, and he thanked God he had lived to see his countrymen spend 20 millions sterling in such a cause. He died 29th July 1833, and was buried in Westminster Abbey, where there is a statue of him. Yorkshire erected a county asylum to his memory, and Hull a column. In 1797 Wilberforce married the daughter of Mr J. Spooner, the banker of Birmingham, by whom he had a family of six children. Wilberforce is the author of a *Practical View of Christianity*, which, on its publication in 1797, went through five editions in half a year, and was translated into four European languages. He interested himself in the founding of the *Christian Observer* (1801) and in many schemes for the welfare of the community. He also assisted Hannah More in the founding of her schools at Cheddar. One-fourth of his income went for private charity. He possessed great conversational powers, and was cheerful in disposition, witty and vivacious, a lover of music and flowers. Mackintosh said, 'I never saw one who touched life at so many points.'

See the Life by his sons (5 vols. 1838), and the shorter Life by S. Wilberforce (1868); Colquhoun, *Wilberforce, His Friends and Times* (1866); and *The Private Papers of William Wilberforce*, edited by A. M. Wilberforce (1897).

Wilbrord. See WILLIBROD.

Wilbye, JOHN (1574–1638), one of the greatest of the English madrigal composers, was born at Diss in Norfolk (his father being a well-to-do tanner), and held the post of household musician first (1593–1626) to the Kystons of Hengrave Hall, Suffolk, and then to Lady Rivers at Colchester, till his death; in 1613 he obtained the lease of a valuable sheep-farm in Suffolk. Of his sixty-five madrigals for three, four, five, or six voices, some are full of delicate fancy and charm, some of deep reflection and emotion, but all are distinguished for their sensitive beauty and excellent workmanship. See various books (1913 *et seq.*) by E. H. Fellowes on the Madrigal (q.v.) and madrigal composers.

Wild, JONATHAN, was born about 1682 at Wolverhampton, and apprenticed to a buckle-maker in Birmingham. About 1706 he deserted his wife, and came up to London, where, during a four years' imprisonment for debt, he consorted with criminals. Thereafter he turned a receiver of stolen goods and a betrayer of such thieves as would not share with him, until for theft and receiving he was hanged at Tyburn in 1725. He was the theme of Fielding's powerful satire (1743). See Seccombe's *Twelve Bad Men* (new ed. 1911).

Wildbad, a watering-place of Württemberg, in the Black Forest, 33 miles SSE. of Carlsruhe, with warm salt baths (from 90° to 98° F.), visited by large numbers annually.

Wild Boar. See BOAR.

Wilde, JANE FRANCISCA, LADY (1826–96), a daughter of Archdeacon Elgee, who in 1851 married Sir W. R. W. Wilde (1799–1869), surgeon and President of the Irish Academy, published *Poems* (1864), *Driftwood from Scandinavia* (1884), *Legends of Ireland* (1886), and *Social Studies* (1893). Sore-tried, she spent her last years in London.

Wilde, OSCAR O'FLAHERTIE (1854–1900), poet and dramatist, was born at Dublin, the son of Sir W. R. W. Wilde and Lady Wilde (q.v.), and studied at Magdalen College, Oxford. There he became the apostle of the 'æsthetic' movement (afterwards caricatured in Gilbert's *Patience*), and in 1878 won the Newdigate prize. *Poems* appeared in 1881, and *Dorian Gray*, a novel, in 1891, but his literary fame rests principally on *Lady Windermere's Fan* (1892), *A Woman of No Importance* (1893), *The Importance of Being Earnest* (1895), admirable specimens of light comedy, abounding in sparkling dialogue and dexterous situations, though a little faded now. In 1896 he was condemned to two years' hard labour for vicious practices, and after his release lived in Paris. *A Ballad of Reading Gaol* (1898) and *De Profundis* (1905) poignantly reflect his tragic experiences, comparatively free from the artificiality which injured some of his earlier work. His collected works were edited 1908–12 by Robert Ross. See books on him by Sherard (1907, 1915), Ransome (1912), Harris (2 vols. 1920), and Bibliography by Mason (1907).

Wildebeest. See GNU.

Wildenbruch, ERNST VON (1845–1909), German romantic writer, was born at Beirut, son of the Prussian consul-general, and served in the army and in the foreign office. His principal dramas are *Die Karolinger* (1882), *Die Quitzows* (1888), *Heinrich und Heinrich's Geschlecht* (1895), *Die Tochter von Erasmus* (1900), while he also published various volumes of short stories and of *Lieder*.

Wilderness, a wooded region in Virginia, 2 miles S. of the Rapidan, and memorable for the

battle between Grant (q.v.) and Lee, May 4–6, 1864—Union loss 18,000, Confederate 11,000.

Wild-fowl. The Act of 1880 specifies as 'wild birds' which may not be shot or killed save between 1st August and the last day of February: American quail, auk, avocet, bee-eater, bittern, bonxie, colin, Cornish chough, coulterneb, cuckoo, curlew, diver, dotterel, dunbird, dunlin, eider duck, fern owl, fulmar, gannet, goatsucker, godwit, goldfinch, grebe, greenshank, guillemot, gull (except black-backed gull), hoopoe, kingfisher, kittiwake, lapwing, lark, loon, mallard, marrot, merganser, murre, night-hawk, night-jar, nightingale, oriole, owl, oxbird, oyster-catcher, peewit, petrel, phalarope, plover, ploverspage, pochard, puffin, purre, razor-bill, redshank, reeve or ruff, roller, sanderling, sandpiper, scout, sea-lark, sea-mew, sea-parrot, sea-swallow, shearwater, sheldrake, shoveller, skua, smew, snipe, solan-goose, spoonbill, stint, stone curlew, stonehatch, summer snipe, tarrock, teal, tern, thick-knee, tystey, whaup, whimbrel, widgeon, wild duck, willock, woodcock, and woodpecker. The term wild-fowl is often limited to waterfowl, which are got at by various special methods, including the gunner's punt, and the decoy. From the decoy-pond several *pipes* covered with hooped network extend in various directions. Wild ducks, widgeon, teal, &c. are induced to enter the wide mouths of the pipes by grain scattered near, by tame decoy-ducks, and with the help of a trained dog. Once in the pipes, they are easily forced along to the narrow end, where they are readily caught.

Wildgans, ANTON, Austrian dramatist, was born at Vienna in 1881, and for a short time was director of the Burg Theatre there. His works, which have had a great success, are couched in poetic language and tinged with symbolism, and include the tragedies *Armut* (1914), *Liebe, Dies Irae.* In 1920 he began a dramatic trilogy, consisting of *Kain, Moses, Jesus.* He has also produced some lyric poetry.

Wild Hunt (Ger. *Wilde Jagd;* also *Wütenheer*), the name given by the German people to a fancied noise sometimes heard in the air at night, mostly between Christmas and Epiphany, as of a host of spirits rushing along, accompanied by the shouting of huntsmen and the baying of dogs. The root of the notion is doubtless to be found in the Christian degradation of the old heathen gods. Like Woden, the lord of all atmospheric and weather phenomena, and consequently of storms, the Wild Huntsman also appears on horseback, in hat and cloak, accompanied by a train of spirits—by the ghosts of drunkards, suicides, and other malefactors, often without heads, or otherwise mutilated. When he comes to a *cross*-road, he falls, and gets up on the other side. Generally he brings hurt or destruction, especially to any one rash enough to address him or join in the hunting cry, as many persons valiant in their drink have done. Whoever remains standing in the middle of the highway, or steps aside into a tilled field, or throws himself in silence on the earth, escapes the danger. In many districts heroes of the older or of the more modern legends take the place of Odin: thus, in Lusatia, Dietrich of Bern; in Swabia, Berchtold; in Sleswick, King Abel; in Lower Hesse, Charles the Great; in England, King Arthur; in Denmark, King Waldemar. The legend has also in recent times attached itself to individual sportsmen, who, as a punishment for their immoderateness or cruelty in sport, or for hunting on Sunday, were condemned henceforth to follow the chase by night. In Lower Germany there are many such stories current of one Hakkelberend, whose tomb even is shown in several places.

Another version of the Wild Hunt is to be found in the legend prevalent in Thuringia. There the procession, formed partly of children who had died unbaptised, and headed by Frau Holle or Holda, passed yearly through the country on Holy Thursday, and the assembled people waited its arrival, as if a mighty king were approaching. An old man with white hair, the faithful Eckhart, preceded the spirit-host to warn the people out of the way. In one form or other the legend of the Wild Hunt is spread over all German countries, and is found also in France, and even in Spain. In England we meet substantially the same notion in folklore—phantom dogs, like the black Shuck-dog of Norfolk and the Mauthe hound of Peel in Man, the 'Wisht Hounds' of Dartmoor, headless horses, a ghostly coach and horses swept along in a storm of wind. In Shropshire Miss Burne describes 'Wild Edric,' 'Squire Blount' with his coach and four, 'Madam Pigott' with her babe in her arms; Henderson tells us of the 'Seven Whistlers' and the spectral pack called 'Gabriel's Hounds' which may still be seen, and more often heard, in the bleak and lonely moors of the north country. The latter are monstrous human-headed dogs which sweep through the air, and portend death or calamity to the house over which they hang. Yarrell ascribes these weird sounds heard on dark nights to the bean-geese flocking southwards on the approach of winter, and Buckland ascribes the strange rustling, rushing sound often heard in dark still nights of winter to the flight of the redwings. This sound is called the Herring Spear or Herring Piece by the Dover and Folkestone fishermen, who mostly count it as an omen of good success for their fishing, while the cry of the Seven Whistlers again they usually consider as a death omen.

Wilfrid, ST, Bishop of York, was born in Northumbria in 634. He was brought up in the monastery of Lindisfarne, but at eighteen visited Rome, returning in 658 a warm partisan of the Roman party in the controversy with the native church on the shape of the tonsure and the time of keeping Easter. At the synod of Whitby (664) he contended against Bishop Colman, and succeeded in gaining over the king, who, learning it was only St Peter to whom the keys had been given, thought it most prudent to be on his side lest Peter should pay him out in his need by closing the gate upon him. Already he had been given the monastery at Ripon, and now he was chosen Bishop of York, being consecrated at Compiègne. On his return he found that Chad had been elected Bishop of Northumbria; but Archbishop Theodore restored Wilfrid. He improved the minster of York, built a splendid church at Hexham, some of the underground portions of which still remain, and raised a new minster at Ripon, the vault of which, called St Wilfrid's Needle, still exists. Theodore, without consulting Wilfrid, divided Northumbria into the sees of Lindisfarne, Hexham, and Whitherne, in addition to York, and Wilfrid made his appeal to Rome. On the journey he was driven by a storm to the coast of Friesland, the inhabitants of which were still pagan. Such was the effect of his preaching that thousands were baptised, and that work of conversion begun which was to be completed by Boniface and Willibrod. Pope Agatho decided in his favour, but King Ecgfrid flung him into prison. He escaped to Sussex, was allowed to return by the new king Aldfrid in 686, keeping the sees of York and Ripon. But again he appealed to Rome (704), and was finally allowed to keep Ripon and Hexham, but not York. He died in 709.

The *Vita Wilfridi*, by Eddi, a monk of Canterbury brought north by Wilfrid to teach Roman singing, was edited by Raine, in *Memorials of the Church of York*

(Rolls series, 1879), and with translation and notes by Colgrave (1927). See also Browne, *Theodore and Wilfrith* (1897).

Wilhelmina, MARGRAVINE. See BAIREUTH.

Wilhelmshaven, the chief naval port of Germany, is on the west side of the entrance of the bay or gulf of Jahde, 45 miles NW. of Bremen by rail. The town, first projected in 1856, was regularly laid out on a strip of ground bought by Prussia from Oldenburg in 1853, and was inaugurated by King William in June 1869. The creation of the outlying forts and an elaborate system of torpedoes, with moles, extensive basins, dry-docks, vast stores for the navy, and workshops for all the requirements of a fleet, was very costly—the massive buildings being erected on soft and swampy ground, without any natural advantage save its situation. A harbour for commercial purposes was made to the south. The development of the naval base at the beginning of the 20th century was very rapid, but the Treaty of Versailles reduced the personnel at Wilhelmshaven considerably (see GERMANY, *Navy*). During the revolution in November 1918 there was much mutinous trouble among the crews stationed here. Pop. 30,000.

Wilhelmshöhe. See CASSEL.

Wilken, GEORGE ALEXANDER, a distinguished ethnographer, was born, 13th March 1847, at Pomohen in Java, son of a missionary. After his education at Rotterdam, he served eleven years in the Dutch Indian Civil Service, returning home on furlough in 1880. The year after he became lecturer in the Leyden Municipal Institute. Already in 1884 the university had given him an honorary doctorate, and in 1885 he became its professor of the Geography and Ethnography of the Indian Archipelago. He died at Leyden, 28th August 1891. The essays on Indian ethnology and folklore in the *Indische Gids* and the *Bijdragen van het Koninklijk Instituut* possess a value quite unusual even in such publications. One article, for example, on spirit-worship among the races of the Indian Archipelago, alone extends to 256 pages. Others treat with unexampled fullness of knowledge and clearness of exposition native Dutch Indian theories of relationship and the laws of marriage and inheritance, marriage and betrothal customs, cretinism, the couvade, circumcision, &c. Also on matriarchy among the ancient Arabs he published a solid work in 1884. Vol. i. of a collected edition by Dr Pleyte appeared in 1892.

Wilkes, CHARLES (1798–1877), American naval officer. See TRENT AFFAIR.

Wilkes, JOHN, the second son of Israel Wilkes, a distiller at Clerkenwell, where John was born on 17th October 1727. He was educated first at Hertford under Mr Worsley, and second at Aylesbury under Mr Leeson, who accompanied him to Leyden as his tutor. Charles Townshend and Dowdswell, afterwards Chancellors of the Exchequer, and the Rev. Dr Carlyle were among his fellow-students at Leyden. He travelled through the Netherlands and a part of Germany before returning home. The acquaintances he made abroad were his introducers to fashionable society at home, where he became the boon companion of young profligates. He married to please his parents at the age of twenty-two, his wife being Miss Mead, the daughter of an eminent physician and an heiress. She was ten years his senior, and the union, as he phrased it, was 'a sacrifice to Plutus, not to Venus.' After a daughter had been born to them, the ill-matched pair agreed to live apart. Wilkes was one of a select and disreputable society, the Monks of Medmenham (q.v.), of which Sir Francis Dashwood, afterwards Lord Le Despencer, was the chief, and the Earl of Sandwich was a member. He was intimately acquainted also with some of the best men of the day, William Pitt and Lord Temple being among them. He agreed with Pitt's politics, and aspired to be his follower. An unsuccessful candidate for Berwick-upon-Tweed in 1754, he was returned to parliament for Aylesbury in 1757. Though not then a man of note, he filled positions of honour, being high-sheriff for Buckinghamshire, and first lieutenant-colonel and next colonel of the Bucks Militia. His electoral contests had involved the expenditure of £10,000, and he wished to serve his country in a lucrative office. Lord Bute having declined to appoint him ambassador to Constantinople or governor of Quebec, he vigorously attacked the ministry in the *North Briton* (1762–63), a weekly journal which he had founded. Before the twenty-seventh number appeared he was threatened with prosecution, while he had to atone for unpleasant references to Lord Talbot by fighting a duel with him. In the forty-fifth number some strong but not unjust comments were made upon the king's speech on opening parliament. Lord Halifax, one of the secretaries of state, issued a general warrant for the apprehension of all concerned in the article, which was deemed a libel. The person and papers of Wilkes were seized: after examination before Lords Halifax and Egremont, he was committed a close prisoner to the Tower. Lord Chief-justice Pratt, of the Common Pleas, ordered his release on the ground of privilege as a member of parliament. It was then held and afterwards determined that general warrants were unconstitutional, and that everything done in virtue of one was illegal. He obtained large damages at law for the indignities of which he had been the victim. His resistance and protests made him the hero of the hour; 'Wilkes and Liberty' became the cry of the people. But he had a private press at which some scandalous verses were printed for private circulation, and an inkling of this was obtained from the papers which were seized. The Earl of Sandwich read extracts in the House of Lords from the purloined copy of an 'Essay on Woman,' which was declared to be a most scandalous, obscene, and impious libel. The ministerial majority in the House of Commons expelled Wilkes on 19th January 1764 for being the reputed author of No. 45 of the *North Briton*. Before this he fought a duel with Mr Martin for words at which the latter took offence, and received a bullet in his belly. He was tried and found guilty during his absence from England for printing and publishing the 'Essay on Woman' (1763), of which a copy had never been made public, except by Lord Sandwich in the House of Lords, and he was outlawed for non-appearance. Returning to England in 1768, he became a candidate for the City of London, but failed, while a subsequent attempt to represent the county of Middlesex in parliament ended in his triumphant return. On his appearing before the Court of King's Bench his outlawry was reversed on a purely technical point, and the Lord Chief-justice afterwards sentenced him to twenty-two months' imprisonment and to pay a fine of £1000. While in prison he wrote a preface to a letter of Lord Weymouth in which he charged the secretary of state with instigating the massacre in St George's Fields, and this was declared a seditious libel and made the pretext for his expulsion from parliament. He was re-elected and, after his fourth election, the House of Commons declared him ineligible to sit, and admitted Colonel Luttrell in his stead. These high-handed proceedings against him increased his popularity. In 1771 he was elected sheriff for London and Middlesex; in 1774 he became Lord Mayor, was returned without a contest for Middlesex and

re-entered parliament. In 1782 the resolutions invalidating his previous elections were expunged, on his motion, from the journals of the House. He had become chamberlain of the city in 1779; he retired from parliament in 1790, and died on 20th December 1797. His life was agitated and eventful. Since his day general warrants have never been issued, and the privileges of electors have been respected by parliament, while the liberty of the press owes much to him. He wrote pungently. His tastes were literary, and his acquaintance with the classics was wide. He wrote and spoke French with precision and fluency. If he had not been subjected to a persecution which was fomented by the king and conducted by his advisers he would have been less of a martyr and, possibly, of a patriot. Franklin said of him that if his moral character had been equal to that of the king he might have taken the king's place. But though his failings were many, his services to the country were considerable, and, while not one of the great men of his age, he was a far more useful personage than many who stood high in the peerage and in the good graces of George III.

See Biographies of John Wilkes and William Cobbett, by Watson (1870); *Historical Gleanings*, by Rogers; *Papers of a Critic*, by Dilke; *Wilkes, Sheridan, Fox*, by Rae (1874); *Life and Times of John Wilkes*, by Fitzgerald (1888); and *Life of Wilkes*, by Bleackley (1917).

Wilkes-Barre, capital of Luzerne county, Pennsylvania, on the left bank of the north branch of the Susquehanna (here crossed by a bridge), 18 miles by rail SW. of Scranton. The city, which lies in the picturesque Wyoming Valley (q.v.), is famous for its enormously rich and extensive fields of anthracite coal. It manufactures mining machinery and tools, iron castings, and silk, lace, and cotton goods. There are also railway shops, brickyards, lumber works, flour-mills, and various academic institutions. Pop. (1870) 10,174; (1900) 51,721; (1920) 73,833.

Wilkie, Sir David, painter, was born at Cults in Fifeshire, of which parish his father was minister, 18th November 1785. His boyish passion for art was too strong to be resisted by his father, who, with much reluctance, sent him in 1799 to study in the Trustees' Academy at Edinburgh. Here he greatly distinguished himself; and returning home in 1804, he painted his 'Pitlessie Fair,' a piece in which already his peculiar genius is pronounced. Shortly after Wilkie proceeded to London, intending to return to Scotland after a year or two of study; but the great success of his picture 'The Village Politicians,' exhibited at the Royal Academy in 1806, determined him to settle in the metropolis. Next year the 'Blind Fiddler' was produced. In 1809 he was elected an A.R.A., and in 1811 an R.A. In 1814, in company with his friend Haydon, he visited Paris, and inspected with great delight the art-treasures at the Louvre. In 1817 he made a run into Scotland, and, while the guest of Scott at Abbotsford, painted his well-known picture of the great poet and his family. During these years Wilkie had been engaged on the series of pictures on which mainly his fame rests; pictures familiar by engraving to every one ('Card Players,' 'Rent Day,' 'Jew's Harp,' 'Village Festival,' 'Blind Man's Buff,' 'Distraining for Rent,' 'The Penny Wedding,' 'Reading of the Will,' &c.), in which the homely humours of humble life are expressed by a vehicle appropriately simple, and of charming purity and transparency, his style including breadth, skilful technique, and elaborate finish. In this style, distinctively his own, his genius is commonly held to have culminated in 'The Chelsea Pensioners listening to the News of Waterloo,' which was painted during the years 1820–21. This work was a commission from the Duke of Wellington, who paid the artist 1200 guineas for it. Subsequently he changed his style, sought to emulate the depth and richness of colouring of the old masters, and deserting the homely life, which he could treat so exquisitely, chose elevated, and even heroic subjects, to the height of which he could never rightly raise himself. The florid picture, painted in 1830, of 'George IV. entering Holyrood,' which, though not without its fine points, can delight no one but a flunkey, gave the first hint of the change; and no doubt a tour on the Continent, including Italy and Spain, which he made for his health in 1824, did something to stimulate the new and unwise ambition. By common consent it has been adjudged unwise; and Wilkie remains, and will remain, memorable not for the quasi-high art of his later years, but for the simpler and truer art of his earlier time. To his later period belong the 'Princess Doria,' 'The Maid of Saragossa,' 'The Two Spanish Monks,' 'The Preaching of John Knox,' 'Columbus in the Convent,' 'Napoleon and Pius VII.,' and 'Queen Victoria at her First Council.' He also painted portraits in some respects admirable, and was successful as an etcher. He never ceased to be popular, and honours continued to be showered upon him. On the death of Sir Henry Raeburn, he succeeded him as Limner to the king; in 1830 he was made Painter in Ordinary to the king, in room of Sir Thomas Lawrence deceased; and in 1836 he was knighted. Wilkie had never been robust, and his health now began to give way seriously. In 1840, seeking to re-establish it, he once more left England; but he did not find what he sought. Having visited Syria, Palestine, and Egypt, he died on his voyage home (1st June 1841), off Gibraltar, and his body was committed to the deep.

As an illustrator of Scottish character and manners in humble life, Wilkie in his best pictures may take rank with Burns in poetry, and Scott in fiction. As a man he was kindly, warm-hearted, and of essential generosity of disposition. See the Life by Allan Cunningham (3 vols. 1843), Redgrave's *Century of Painters*, and monographs by Mollett (1881), and Pinnington (1900).

Wilkins, John, Bishop of Chester from 1668 till his death, was born near Daventry in Northamptonshire in 1614, son of an Oxford goldsmith. At thirteen he was admitted at New Inn Hall, whence he shortly removed to Magdalen Hall, graduating B.A. in 1631. As chaplain successively to William, Lord Say, George, Lord Berkeley, and Charles, Count-palatine of the Rhine, he found time for studies in mathematics and mechanical philosophy, and aided in those meetings in London out of which grew the Royal Society. He sided with the parliament, and was appointed Warden of Wadham College. In 1656 he married Robina, widow of Peter French, and sister of Oliver Cromwell, and in 1659 was appointed by Richard Cromwell Master of Trinity College, Cambridge. Dispossessed at the Restoration, he soon recovered court favour and became preacher at Gray's Inn, rector of St Lawrence Jewry, Dean of Ripon, and Bishop of Chester. He died November 19, 1672. As an ecclesiastic he was tolerant and moderate, and indeed looked little better than a trimmer to the zealots, and even the eulogy of that pedantic old Tory, Anthony Wood, is coloured with a characteristic touch of malice—'there was nothing deficient in him but a constant mind and settled principles.' His name now survives only in his curious treatises: *Discovery of a New World* (1638), which gravely discusses the possibility of communication by a

flying-machine with the moon and its supposed inhabitants; *Discourse concerning a New Planet* (1640), an argument that our earth is one of the planets; *Mercury, or the Secret and Swift Messenger*, showing how a man may with privacy and speed communicate his thoughts to a friend at any distance; *Mathematical Magic* (1648); *Essay towards a Real Character and a Philosophical Language* (1668), founded on Dalgarno's treatise. His theological writings are forgotten.

Wilkins, Mary Eleanor, American novelist, was born at Randolph, Mass., in 1862, and has written poems and books for children, but is especially known for her convincing pictures of New England life and character, as in the collections of short stories, *A Humble Romance* (1887), *A New England Nun* (1891), *Silence* (1898).

Wilkins, Peter. See Paltock.

Wilkinsburg, a residential borough of Allegheny county, Pennsylvania, 7 miles E. of Pittsburgh; pop. 24,400.

Wilkinson, Sir John Gardner, Egyptologist, was born at Hardendale in Westmorland, 5th October 1797, had his education at Harrow and Exeter College, Oxford, and in October 1821 set out for Alexandria to devote himself to exploration. Making Cairo his headquarters, he travelled through and investigated almost every part of Egypt and Lower Nubia, twice ascended the Nile as far as the Second Cataract, spent a year at Thebes alone, and visited also the deserts on either side of the river, and the Egyptian oases, making indeed in these twelve years a complete survey of Egypt, and transmitting to the British Museum more than three hundred antiquarian objects. His *Materia Hieroglyphica* (1828), its supplement, devoted to Thebes alone (1830), and his *Topographical Survey of Thebes* (1830) he published during his first stay in the country. Next followed his *Topography of Thebes* (1835), and his famous work, *Manners and Customs of the Ancient Egyptians* (3 vols. 1837), with its complement on the Religion and Agriculture (2 vols. and a vol. of plates, 1841). A new edition of the *Manners and Customs*, uniting both the original series, was edited by Dr Birch (3 vols. 1879). Wilkinson, who was knighted in 1839, again visited Egypt in 1841 and in 1843, as well as Syria, Constantinople, Tunis, Sicily, Dalmatia, and Montenegro. He paid a fourth visit to Egypt in 1848, a fifth in 1855, presented his collection of coins and antiquities to Harrow, and died 29th October 1875. Wilkinson's other works include books on Dalmatia, travellers' handbooks to modern Egypt, ancient Egyptian architecture, &c., together with the Egyptian notes to Rawlinson's *Herodotus*.

Will is, in English law, an instrument by which a person makes a disposition of his property to take effect upon or after his death. A will may also be made by a testator for the purpose of appointing his executors or guardians of his infant children, or for some other purpose taking effect after his death. A person having testamentary capacity may, under English law, dispose by will of all real and personal estate which he shall be entitled to, either at law or in equity, at the time of his death. Every person of sound mind and not under some special disability may make a will. The question whether a testator was of sound disposing mind at the date of executing his will is a question of fact. Where insanity before the date of the will is established, the burden lies on the party propounding the will to show that it was made after recovery or during a lucid interval. An infant, or person under twenty-one years of age, cannot—except in certain special cases (*vide infra*)—make a valid will. By the Married Women's Property Act, 1882, a married woman may dispose of her separate property by will in the same manner as if she were unmarried. If, however, she made a will while married, and survived her husband, the will did not, prior to the Married Women's Property Act, 1893, carry property acquired by her after her husband's death. But now, under the Act of 1893, the will of a woman dying a widow after 5th December 1893, even if it is executed during coverture, is construed to speak as from the date of her death and operates on all the property which she has at her death, whether she was or was not possessed of or entitled to any separate property at the time of making the will.

The requirements of English law relating to the mode of making a will are: (1) The will must be in writing; (2) the writing must be signed by the testator or by some person in his presence and by his direction; (3) the testator's signature must be at the foot or end of the writing; (4) the signature should be made or acknowledged by the testator in the presence of two witnesses present at the same time; (5) the two witnesses must attest and subscribe the will in the presence of the testator. Any gift, beneficial devise, or bequest to a person who attests the will, or to the wife or husband of such person, is void.

A soldier (including a member of the Air Force) in actual military service, or a mariner or sailor at sea, or a member of His Majesty's naval or marine forces in such circumstances that if he were a soldier he would be in actual military service, can, under the Wills Act, 1837, read along with the Wills (Soldiers and Sailors) Act, 1918, dispose both of personal and real property by a nuncupative will—i.e. an oral declaration, made without writing, of the testator's wishes as to the disposition of his property in the event of his death—or by a writing executed without the formalities required in the ordinary case for a will, e.g. a letter or other informal or unattested writing, provided it shows the intention of the testator. Further, under the Acts of 1837 and 1918, such a soldier or sailor can make a will notwithstanding infancy. Since such a soldier's or sailor's will does not require an attesting witness, a legatee who attests the will does not lose a gift or legacy bequeathed to him in the will.

A will is always revocable by the testator. Under the Wills Act, 1837, sec. 18, a will by a man or woman is revoked by his or her marriage; but now by section 177 of the Law of Property Act, 1925, a will made after 31st December 1925, expressed to be made in contemplation of marriage, is not revoked by that marriage. A will may be revoked by a subsequent will or codicil expressly revoking that will or all former wills. Even where a subsequent will or codicil does not contain an express revocation, yet if it disposes of all the testator's property it is held to be a complete revocation of the earlier will. The mere fact of making a subsequent testamentary disposition does not, however, operate a total revocation of a prior will, unless it expressly revokes the earlier will or the two are incapable of standing together. It is indeed a general principle of construction that where there are several testamentary writings which are not inconsistent they will be considered the will of the testator so far as they are not inconsistent. Again, a will may be revoked by burning, tearing, or otherwise destroying it, by the testator or by some person in his presence and by his direction, with the intention of revoking it. If a will is destroyed accidentally or lost it will not thereby be revoked, but a copy of it or its contents as proved by parol evidence will be admitted to probate. The mere cancellation of a will does not in itself amount to a revocation, so that probate

will be granted of a will in its original shape, though a pen has been drawn through the body of the will, and through the testator's signature, the attestation clause, and the names of the witnesses. The only mode in which a revoked will or codicil can be revived is either by re-execution or by a codicil duly executed showing an intention to revive it.

As soon as possible after the testator's death it is the duty of the executor to prove his will. If there is no executor, letters of administration with the will annexed are granted (see ADMINISTRATOR). Every instrument purporting to be testamentary and executed in accordance with the formalities prescribed by law is entitled to probate if it disposes of property, whether personal or real, situated in England or contains an appointment of an executor. Probate is a certificate granted by the Probate Division of the High Court of Justice to the effect that the will of a certain person has been proved and registered in the court, and that administration of his effects has been granted to the executor proving the will. A will may be proved in common form or in solemn form. Probate in common form of a will which, on the face of it, is regularly executed, is granted on the executor swearing and filing (1) an affidavit that the will is the last will of the testator and that he will faithfully administer the estate, and (2) an affidavit for Inland Revenue (see PROBATE COURT). A will may be proved in common form either in the principal Registry of the Court of Probate, or, where the testator had at his death a fixed place of abode within any district, in the probate registry of such district. The probate copy of a will is accepted in English courts as conclusively showing the state in which the will was at its execution and containing the whole will. Proof in solemn form is by an action in law for the purpose of establishing the validity of the will propounded.

In Scotland the wife (or husband) and the children of a deceased person have certain legal rights in his (or her) estate; and the power of a testator to dispose of his or her property, heritable or moveable, by will can only be exercised subject to these legal rights (see JUS RELICTÆ; LEGITIM). Subject to the legal rights of her husband and children, a married woman has full power to dispose of her heritable and moveable estates by testament or other *mortis causâ* deed. A nuncupative or oral will is valid to the amount of £100 Scots (£8, 6s. 8d.). With that exception a will must be in writing. A holograph will, i.e. a will written and subscribed by the testator, is valid without witnesses. A will which is not in the handwriting of the testator must be signed by him and by two witnesses who saw him sign or heard him acknowledge his signature; but an attesting witness cannot adhibit his signature after the death of the testator to the effect of rendering the testamentary writing valid. In Scotland a will is not revoked by the subsequent marriage of the testator; but it is presumed that a will which makes no provision for children *nascituri* is revoked by the birth of a child to the testator after the date of the will. This presumption—known as the *conditio si testator sine liberis decesserit*—has effect equally in a case where the testator at the date of the will already had children as in the case where the testator at the time of the will had no children. The presumption, however, may be rebutted by circumstances. The confirmation of an executor-nominate in Scotland corresponds generally to probate in England. Confirmation is the ratification by a competent court of an appointment of executors, and constitutes a title to uplift, administer, and dispose of the personal estate of the deceased contained in an inventory given up by the executors. Confirmation has, in some respects, a more limited effect than probate. In particular, in a confirmation it is only the nomination of executors that is confirmed, and any judgment upon the documents is limited to the validity of that nomination.

A will made within the United Kingdom by a British subject is, as regards personal estate, held to be well executed, and is admitted in England to probate and in Scotland to confirmation, if it be executed according to the forms required by the laws for the time being in force in that part of the United Kingdom where it was made. A will made out of the United Kingdom by a British subject, whatever his domicile at the time of making the will or at his death, is, as regards personal estate, held to be well executed for the purpose of being admitted in England to probate and in Scotland to confirmation, if it be made according to the forms required either by the law of the place where it was made, or by the law of the place where the testator was domiciled when it was made, or by the laws then in force in that part of His Majesty's dominion where he had his domicile of origin.

Will. There is considerable diversity of opinion among psychologists and philosophers as to the nature of volitional processes and the mode of action of the will. In the older philosophical classification of the powers of the soul will-acts were taken to include all processes of conscious appetition as contrasted with those of cognition, i.e. mental acts related to doing as opposed to knowing; and to the will were attributed all such experiences as desires, aversions, resolves, choices, and the like. Will was thus conceived to be the appetitive faculty in general, embracing among its phenomena what we now commonly distinguish from them as affections or feelings. Within this conception, however, a distinction came to be made and increasingly stressed; that, namely, between the sensitive and the rational appetite or will proper, the typical character of which was exemplified in deliberation and choice. In subsequent psychological teaching a tripartite division of mental phenomena into cognitions, affections, and conations as modes of conscious experience was usually adopted, and a conception of mind as the sum of its experiences, rather than as a subject reacting to its environment by knowing and doing, was put forward. To this view of mind as constituted by the contents and states of consciousness (Phenomenalism; *vide infra*) are to be attributed the attempts to reduce will to phenomena of cognition or affection.

More recent psychological doctrine inclines towards the earlier conception of mind. The conscious organism is looked upon as essentially a reagent to stimuli or situations, and its reactions are held to be rooted in instinctive dispositions. These are native psycho-physical mechanisms which lead us to attend to certain kinds of stimuli and to act in their regard in a particular way, such action being invariably accompanied by feeling. On the basis of the instincts, the conative character of which is stressed, sentiments, or relatively permanent acquired dispositions, come to be formed. These are dispositions towards (among other things) intellectually conceived ideals, such as truthfulness, honesty, ideal selfhood, and the like. Like the instincts they are also regarded as conative, and, together with the connate tendencies towards action, they become integrated in character. Character is thus conceived as the organised system of conative dispositions towards objects and ideals. According to this view will is often said to be character in action. This view, advanced independently of it, has been largely supported by psychoanalytic theory (*vide infra*).

What is emphasised in all accounts of will is its active or causal aspect. This, it is true, belongs

to conation in general, and indeed to all mental process whatever. The failure to distinguish different modes of mental activity, and the identification of all mentally initiated activity with will, have, however, led to great confusion in the psychology of volition.

No distinction more consistently runs through consciousness than that between the voluntary and the involuntary. We ascribe certain thoughts and bodily actions in a peculiar way to ourselves as willed. We hold them to be, at least to some extent, under our control, and we consider ourselves responsible for them. On the other hand, there are thoughts and actions for which we feel no such responsibility, which occur unbidden, and even in spite of ourselves. Such, e.g., are spontaneous, reflex, and instinctive actions and trains of thought, as revery or dream. Though initiated or accompanied by consciousness we do not call these voluntary. The problem here is not that of 'freedom,' but rather of the way in which the voluntary and involuntary are to be psychologically distinguished.

One character of the voluntary as opposed to the non-voluntary, both in the case of thought and of action, is the fact that all voluntary processes include as an integral part a more or less explicit representation of an end to be attained. The will to solve a problem has already the solution in view; the will to bring about a change in the environment envisages the environment as changed. The process of attaining the desired end, further, is accompanied by affective changes such as satisfaction or pleasure; its frustration by dissatisfaction and unpleasure. This latter fact, however, is not so clearly a criterion of the voluntary as the preperception of the end itself, since similar affective changes also accompany the attainment of instinctive ends by processes which we recognise as involuntary. A like remark may be made with regard to consciousness of striving or effort as a criterion of will.

The assumption has been made that there is no specific phenomenon characteristic of will, but that states of volitional consciousness can be explained as due to the interplay of cognitional or affective elements alone. The attempt to reduce will to cognitional elements is best exemplified in associationist accounts of voluntary action. Thus it has been held that every impression (and derivatively every idea) carries with it as part of itself an impulse to action (in neurological terms, that every afferent impulse is essentially connected with an efferent one), and that the action carried out is marked in consciousness by the kinæsthetic sensations arising from it. These sensations become associated with the antecedent impressions and ideas in such a way as eventually to rise in consciousness as images, on the occasion of an actual or ideal re-presentation of the original stimulus, before the action takes place. Accordingly, we believe that the ensuing action is the result of the images. We thus have the illusion of a mental causality. Choice is similarly explained. Two or more impressions or ideas with their tendencies to discharge in action are simultaneously present in consciousness, and an inhibition arises between them which prevents the discharge of either. In the meantime associated ideas develop in connection with each, until one of the groups obtains ascendency and discharge takes place. This process leads to the illusory belief that a mental selection has occurred. A final step in this explanation of volition is the account given of a third illusion, viz. that it is we ourselves who decide. During the period of inhibition those ideas or images most frequently aroused in consciousness (viz. of our own bodies) develop strongly, and, being interposed between the image of the action and the action itself, are falsely interpreted as causal. We have the illusion that we cause the resultant action. Such causality as may really obtain in the whole process, however, is not mental but physical. One of the most recently advanced systems of psychology would account for voluntary thought on precisely similar lines. Thought, it is asserted, is inner speech, and inner speech is muscular movement. Indeed, consciousness as such, far from being causal, may, and properly should, be neglected in any scientific account to be given of behaviour; for behaviour, including thought, consists essentially in physical reactions to physical stimuli.

An objection to such an account of the voluntary lies in the persistent refusal of the mind to accept as illusory what it is convinced is in reality factual. Further objections are urged on the grounds that experimental work has shown that the principle of association alone is insufficient to explain the facts; that controlling or determining tendencies must also be postulated, and that the part played by kinæsthetic imagery has been greatly exaggerated.

The reduction of volitional processes to those of feeling is typically found in the so-called emotional theory. Here, again, no specifically characteristic phenomenon of will is admitted; all voluntary processes are derived from a peculiar interplay of feelings. In explanation of the voluntary the termination of a state of emotional consciousness is the only important point to be considered. Volitions are mental states in which unpleasure, excitement, and tension give place to pleasure, relief, and relaxation. The fusion of these developing feelings gives rise to characteristic feelings of activity and, in choice, decision, which immediately terminate the state in a final feeling of realisation. In this view feelings of activity, decision, and realisation are characteristic of acts of will. But, since the triad of elementary feelings which gives rise to them is found in similar combination alike in impulsive acts, voluntary acts, and acts of choice, we are led to consider all such acts as voluntary. The difference between them lies in motive. In impulsive acts only one motive is to be discovered. There are several motives in voluntary acts, one of which only is clearly in consciousness. In choice, again, several motives are present; but one of these ultimately comes to be apperceived alone. The typical voluntary process is thus explained by apperception. Will is attentive consciousness; and voluntary actions differ from simple apperception by reason of its external consequences only.

In criticism of this account of will it has been urged that there is a radical distinction between impulsive acts and acts of will, and that the latter cannot properly be reduced to the former. Moreover, the reduction of will to phenomena of apperception is unduly restricted. It seems impossible to explain certain of the phenomena entering into voluntary processes either as mere fusions of feelings or as due to enhanced clearness.

The foregoing theories achieve the reduction of all will processes to the interplay either of cognitions or affections—an essentially mechanical conception on the one hand, and an essentially dynamic one on the other—at the expense of a denial of the commonly accepted distinction between the voluntary and the involuntary. A third group of theories make the distinction rest upon a characteristic and irreducible mental phenomenon, sometimes designated as self-causality, sometimes as a 'fiat' (James) that action shall ensue. Originally introspection was adduced in support of the theory; but it has since been considerably developed by psychological research. In the case of external actions the 'fiat' is held to produce a

neuro-muscular tendency which (not unlike that of an instinct) may be maintained for a time in readiness for discharge, or may at once discharge in action through connate or acquired kinetic units. In the case of internal actions, it is held to produce a mental 'set,' which accounts for the orderly sequence of ideas in relation to the task in hand. These developments in the theory are due to the results of experiments on conditioned reactions, and to the introspective and objective data of a number of researches on processes of resolving and choosing. The chief advantage of the theory lies in the distinction it indicates between conation and volition. Thus, while all conscious processes may be said to be active in the sense of conative, they are not necessarily willed. Conation may well be character in action; but character in action is not therefore will. All consciousness may be motor in the sense that any conscious event may initiate thought or movement; but it does not follow that the consequent thought or movement is either wilfully initiated or directed. The main objections to this view are that it implies a transcendental will over and above the 'fiat,' and that the 'fiat' itself is not describable as are, e.g., images and feelings. These objections are met by the contention that as consciousness of images or feelings implies a subject conscious of them, so awareness of willing implies a subject who wills, and by the further contention that the 'fiat,' or self-activity, even if indescribable, is a conscious event which plays its part in the subsequent course of consciousness.

Asserted facts of introspection and the necessity of postulating a subject of conscious experience have thus led many psychologists to the position that over and above cognitive, affective, and conative phenomena, a true will-element *sui generis* is to be admitted, and that this is in an especial way typical of the activity of a self. Others assert that the self is immediately cognised as active in all experience, but especially in will-acts. This last view still further emphasises the distinction between conation and volition. While the subject is always experienced as active, it is only in the experience of it as resolving, consenting to or accepting motives, making motives its own and the like, that it is cognised as willing. Will thus comes to be distinguished from conation in general, requiring as conditions of its realisation a concept or thought of the result of activity, the mental or neuro-muscular mechanisms through which to work, and the possibility of the release of conative energy. The chief objection to this view is that it identifies the immanent experience with the transcendental self. But the objection, it is urged, arises only in a metaphysical conception of reality which it is not incumbent upon psychology as a science to accept or discuss; self-awareness is not in reality a matter of philosophical theory.

Of recent years an enormous literature, having a bearing upon the problem of the will, has grown up in medical science. Clinical observations and the successful treatment of pathological cases by methods of psychotherapy, and especially of psychoanalysis, have led to the theory that many morbid symptoms have their root in unconscious mental processes of an emotional kind. The theory of the unconscious has been enlarged to embrace 'normal' consciousness and behaviour as well as pathological; and the view is generally adopted that consciousness and conduct are largely, if not entirely, determined by unconscious or 'repressed' wishes, more or less in equilibrium with repressing tendencies. In matters of detail psychoanalysts fall into several sharply distinguished schools according (among other things) to the way in which they interpret the libido as psycho-energetic, sexual, self-assertory and the like, and their views as to personal and racial unconsciousness. In general, however, they are agreed that the drive to action is to be traced to one or other, or to several, of the instinctive tendencies of academic psychology. In emphasising the emotional character of the unconscious complexes which condition both consciousness and behaviour, usually no definite distinction is drawn between the affective and conative aspects of emotion; but it is clear that the conative or dynamic aspect is of the greatest importance. This brings psychoanalytic theory into touch with the will-problem; and, as in academic psychology, so here two contrary views are advanced. One is rigidly deterministic (*vide infra*), and allows no place for the distinction between conation and volition. Conscious mind, character, and conduct are the results of an interplay of (largely unconscious) conative tendencies. The other is indeterministic, and makes allowance for volitions as essentially conscious experiences.

The philosophical problem of free-will is intimately connected with the foregoing; since, while the mode of action of the will is a question for metaphysical speculation, the data discussed in its solution have been largely drawn from introspection. Historically the problem arose not in psychology but in ethics. Its subsequent development has been in the main theological; but with the rise of modern philosophy it has also been discussed on purely naturalistic grounds.

Among the Greeks the question does not appear to have been clearly formulated before Aristotle; though some have held that the Pythagorean doctrines of responsibility and transmigration of souls necessarily imply it. Aristotle, in criticising the intellectualistic determinism of Socrates—viz. that the good, being identical with the true, determines the will as it does the intellect—has recourse to individual experience. Vice, he asserts, is not merely ignorance; it is something voluntary. We are able to act in opposition to our apprehension of the good; our actions, as means to ends, are contingent and subject to choice; conduct is not always predictable. Theological preoccupations did not here obscure the psychological and ethical issue. It is none the less difficult to fit an unequivocal doctrine of moral freedom into the framework of Aristotle's conceptions of the universe and its prime mover. More in accord with their theological position of materialistic pantheism, the Stoics excluded all freedom from human affairs and substituted a universal and fatalistic determinism. On the other hand, Epicurus maintained a doctrine of free-will, and, while generally accepting the physical system of the Atomists, modified it by endowing the atoms themselves with a power of random deviation from their vertical lines of descent.

The Christian conception of the problem is characteristically different from that of Greek philosophy in that it is primarily a theological one. The doctrines that man is a creature of God, that the divine law is a moral law, and that eternal rewards and punishments are its sanctions, made the assertion of free-will of paramount importance. But the problem was complicated by the further theological doctrines that God is at once absolutely omniscient and omnipotent and absolutely good. The apparent antinomy between the goodness and omnipotence of God in relation to moral evil in the world found a first solution in the dogmas of the fall of man and his redemption by grace, the most definite presentation of which is given in St Paul's Epistle to the Romans. The basic antinomy, however, remained to provoke a secular controversy with regard to free-will according as to which of these divine attributes was theoreti-

cally stressed. Those who emphasised the divine goodness emphasised also human freedom, as the power of obeying or disobeying the law, thus relating the determination of the will to man rather than to God. On the other hand, those in whose theology the conception of omnipotence dominated insisted upon the absolute necessity of grace as the source of merit. The principal representative of this latter trend of thought is St Augustine, whose doctrine largely shaped all pre-reformation thought. Against the Manichaeans, indeed, Augustine asserts freedom; but against the Pelagians and Semipelagians he no less strongly asserts the absolute domination of God over the human will—a form of predetermination with difficulty to be distinguished from fatalism. In subsequent development of his doctrine by the scholastics, and especially by Aquinas, free-will in regard to the election of any other than the supreme good was defended; and this was reconciled with the omniscience of God on the ground that his knowledge, being timeless, embraces the future as well as the present and the past. The attempt of Aquinas to reconcile freedom with omnipotence gave rise to two derivative schools of thought both claiming his authority. The Thomists attempt the solution of the antinomy by making the absolute premotion of God inevitably incline man's will to its choices; but, since the will is essentially free, God determines it to choose freely. The Molinists, on the other hand, adopt the solution that God does not premove the will to action, but concurs in its action dependently upon his knowledge. He knows what a free agent will choose in any conditions if given power to choose. Omnipotence is here considered safeguarded in that God is held to provide or to withold the necessary conditions for free choice together with his co-operation in it.

The most rigorous interpretation of scriptural, especially Pauline, texts with regard to the necessity of grace, the providence and predestining election of God, and the corruption of human nature, led to the formulation by the reformers of the 16th century of a theory of strict predestination, which became the current doctrine of the Protestant churches. Luther in controversy with Erasmus explicitly denies freedom. Calvin is equally explicit. No good action can be performed except as necessitated by irresistible grace. Man does not co-operate, but is fatally moved by grace. In this doctrine of predestination God's justice is held to be vindicated by the ascription of free-will to Adam, in whose fall the human race lost its freedom, fell under the subjection of sin and needed redemption. Augustine had already taught that power not to sin belonged to Adam, but was lost in his fall. It is noteworthy that the Council of Trent explicitly asserts freedom of the will even when moved by grace, and the co-operation of the will with grace. Freedom is held to be weakened, but not destroyed, as a result of the fall. From the point of view of the attributes of God it is indifferent whether freedom or predestination be referred to the fall or not. It is a question which can be discussed quite generally; though the doctrines of the fall and redemption by grace still occupy a prominent place in all dogmatic theology.

With the rise of modern philosophy and the gradual divorce of its speculation from theological dogma, the problem of freedom slowly shifted its centre from God to man, and became a purely psychological and ethical one. Descartes asserts freedom; but at the same time he advances a theory of providence akin to determinism. This is entirely consistent with his general doctrines of causation and divine assistance. Malebranche similarly works out a determinist theory in occasionalism; though, as a theologian, he was bound to reject fatalism. Spinoza mathematically deduces from premisses of Descartes a system of pantheistic determinism; and Leibniz leaves small room for freedom in a philosophy in which man must always choose the better, as God has chosen the best of all possible worlds.

In English and Scottish philosophy from Hobbes onward the problem has been minutely debated upon both sides, with increasing emphasis upon the points of view of psychology, ethics, and natural science. The mechanical materialism of Hobbes implied a theory of moral determinism which he accepted. Volitions necessarily follow upon motives which condition them; the only freedom possible is freedom to act in accordance with desire. Locke also, asserting that the motive for action is always the most urgent 'uneasiness,' would properly be called a determinist, had he not modified this by the further assertion that 'we have a power to suspend the prosecution of this or that desire,' which arrests immediate determination and so far constitutes such freedom as we may have. Hume's psychological analysis of the notion of causality provided a still further argument against freedom. The idea that causality consists in any effectual nexus between cause and effect is erroneous. Causality is no more than constant succession. Believing (wrongly) in a necessity in physical causation, and experiencing no such necessity in our own actions, we ascribe freedom to them; though they are in reality as determined by their antecedents as a physical effect is by its cause. Substantially the same reasoning has been advanced by all Associationists. Mill, while explicitly denying that determinism implies either materialism or fatalism, stresses the notion of mere sequence in causality as opposed to 'constraint.' He denies any consciousness of freedom, and considers the conception of free-will unintelligible. He nevertheless holds that both conduct and character are so connected with will that we can educate character by taking the proper means to do so. The considerations leading the English Phenomenalists to determinism are, on the one hand, the psychological fact of the occurrence of motives in all will-acts, and, on the other, the postulate of the universality of the causal succession conceived in the manner of Hume. There is no event without an antecedent; and the antecedent of volition is invariably a motive. Phenomenalism, however, has developed along two different lines. Mill, with most English Associationists, considers motives to be feelings, that which has the greatest apprehended pleasure-value being the strongest and determining action. Others, with Herbart, make presentations the sole necessary antecedents of volition. Will is effort, together with the idea that the object of the effort can be attained; and freedom consists in the inevitable domination of the strongest apperceptive masses over single presentations or feelings.

Freedom of the will, on the other hand, has been defended by a large number of representative British philosophers (e.g. Reid, Stewart, Hamilton, Mansell, Martineau, Ward). Their arguments are based mainly upon the asserted conscious experience of freedom and the moral postulate. To the objection that we are not capable of knowing before we have actually willed it what we are able to will (Mill), libertarians answer that in the act of willing we are conscious of being able to will otherwise. To the further objection that we are always determined by motives and therefore must assume that we are moved by the strongest, the answer is given that we can only say that a motive is the strongest because it actually has been chosen. There are no such things as motives in the abstract. A motive is always someone's motive; and it becomes a

motive only by that someone having made it his own. Acts of will are thus not 'causeless' nor unrelated to motives whether affective or cognitional. They are caused by the self together with motives adopted by the self jointly.

The foregoing objections and answers move within the sphere of psychology alone. Further objections are drawn from physical science, as, e.g., that mental causation of physical action, and particularly such capricious causation as would be implied in freedom, is incompatible with the doctrines of the conservation of energy and the uniformity of Nature. These objections need not, however, be considered here, as they are entirely general in their application to psychical activity in any form as influencing physical nature.

The ethical arguments in favour of freedom rest upon the moral convictions of mankind. Conceptions such as duty, responsibility, and justice, imply ideals to be reached through obedience to law, as well as the power to observe or disobey that law. In this view sanctions are held to have a retributive aspect. Rewards and punishments are not so much regarded as motives supplied to will as consequences of its action. Nevertheless sanctions do provide motives for volition; and it is precisely this psychological fact which is urged by determinists against the moral argument of libertarians. Thus it is denied that responsibility implies freedom, since responsibility only means punishment; and punishment is a deterrent motive determining volition (Mill). Conscience in this view is explained as a knowledge of the justice of punishment for personal wrongdoing.

Morality, however, with its asserted implication of freedom, may be considered without reference to legal sanctions, and thus becomes divorced from psychology as a purely ethical subject. This treatment of the problem is most consistently developed by Kant, whose distinction of reality into phenomenal and noumenal is advanced as a way of escape from the antinomy. All appearance, including mental phenomena, can only be apprehended in a temporal form and under the category of causality. Accordingly, all experience, not excepting experience of volition as the series of motive, desire, and act, occurs as rigidly determined by the laws of phenomenal nature. Nevertheless freedom is a necessary postulate of morality. It is a logical consequence of the categorical imperative. 'Thou canst because thou oughtest.' Hence, though determinism reigns in the phenomenal world, we may hold that we are transcendentally free; there is no reason for denying freedom to a 'thing in itself.' Freedom is thus conceived as the law of the world of noumena, and is identified with reason and will. In this sense will is not only not subject to the phenomenal causality of Nature, but comes to be identified with the moral law itself. It consists in its own autonomy. The chief difficulty in Kant's attempted solution of the problem lies in the fact that all actual experience of the moral lies within the phenomenal sphere, and is therefore causally determined. Freedom and necessity are asserted but in no way reconciled; and no intelligible account is given as to how freedom can enter into or influence human action. Other moralists, while maintaining that freedom is not necessarily a postulate for ethics, since we can judge of the rightness or wrongness of actions without reference to it, assert that the common conviction of moral obligation implies the freedom of the will.

As in Britain so on the Continent and in America, apart from attempted compromises, the extreme positions of determinism and libertarianism have been held in philosophy. Thus Schopenhauer, including in his notion of will conscious desires, unconcious instinct, and all those forces which show themselves operative in inanimate Nature, makes it the essential ground of the world as known, denies freedom as either psychologically or ethically acceptable, and advances a pessimistic theory of the universe. In sharp contradistinction to such views is teaching such as that of Lotze, who strenuously contends for moral liberty. He shows that mental like physical phenomena are governed by law; but maintains that there is a specific active element, to be distinguished from cognition and feeling, in volition. This, as has been shown above, is in accordance with much of the most recent experimental investigation of will-process, though some criticism has been directed against the interpretation of the evidence adduced. Lotze goes further in making our decisions (as to whether we shall follow or not the impulses urging to action) dependent upon deliberation and determination by free choice of the mind. The process of deliberation and choice, however, has been very minutely analysed on the lines of experimental psychology; and it does not appear that freedom is an introspectible experience. For this reason most psychologists who adopt the libertarian view in philosophy lay stress upon ethical considerations rather than upon any asserted psychological evidence for it.

From the point of view of general psychology, the treatises quoted in the article PSYCHOLOGY may be consulted. For special theories outlined above, see Münsterberg, *Die Willenshandlung* (1888); Wundt, *Grundriss der Psychologie* (1897); James, *Principles of Psychology* (1890); McDougall, *An Outline of Psychology* (1923), *Social Psychology* (1908). See also Schneider, *Der thierische Wille* (1880), *Der menschliche Wille* (1882); and for various views and references, Külpe, *Die Lehren vom Willen in der neueren Psychologie* (in *Psych. Studien*, 1889). Bergson, *Essai sur les donnéés immédiates de la conscience* (1889), is interesting as advancing a theory of freedom from the point of view of speculative psychology. For psychoanalytic theory, see Freud, *Die Traumdeutung* (4th ed. 1913), *Das Ich und das Es* (1923); Jung, *Collected Papers on Analytical Psychology* (auth. trans. ed. Long, 2d ed. 1920); Rivers, *Instinct and the Unconscious* (1920); Hart, *The Psychology of Insanity* (1912).

For experimental work on the subject, see Lindworsky, *Der Wille, seine Erscheinung und seine Beherrschung* (2d ed. 1923); Ach, *Ueber die Willenstätigkeit und das Denken* (1905), *Ueber den Willensakt und das Temperament* (1910); Michotte and Prüm, *Étude expérimentale sur le choix volontaire* (1910); Selz, *Die experimentelle Untersuchungen des Willensaktes* (1911); and for criticism, see Wheeler, 'Theories of Will and Kinæsthetic Sensations' (*Psych. Rev.* 1920), 'Analysed versus Unanalysed Experience' (*ib.* 1922).

For the history of the free-will controversy, see Fonsegrive, *Essai sur le libre arbitre* (1887); Volkmann, *Lehrbuch der Psychologie* (1894 f.); Janet and Séailles, *Histoire de la Philosophie* (1887-88). For the scholastic controversy in particular, see Schneeman, *Controversiarum de Divina Gratia Liberique Arbitrii Concordia* (1881). See also Mill, *An Examination of Sir William Hamilton's Philosophy* (4th ed. 1872), as well as the controversy between Ward, Bain, and Hodgson in *Mind*, vols. v. and vi., and Hodgson, *ibid*, vol. xvi.; Sidgwick, *Method of Ethics* (6th ed. 1901); Martineau, *A Study of Religion* (1888); and Scheler, *Der Formalismus in der Ethik* (1921) may also be consulted.

Willard, FRANCES ELIZABETH (1839-98), American social worker, was born at Churchville, N.Y., studied at the North-western University at Evanston, Illinois, and became professor of Æsthetics there. In 1874 she became secretary, and in 1879 president of the Women's Christian Temperance Union. She wrote many pamphlets, articles, books on temperance, &c., and also published autobiographical *Glimpses of Fifty Years* (1889). See Life by R. Strachey (1912).

Willemstad, capital of Curaçao (q.v.), on St Anna bay, has an excellent natural harbour, and

is an important transhipment centre both for Curaçao and for Maracaibo (q.v.) in Venezuela. The trade is chiefly in coffee and in oil. Pop. 15,700.

Willesden, an urban district and parliamentary borough (with two divisions) in Middlesex, adjoining the north-west of London. Pop. (1921) 165,669.

Willet (*Symphemia semipalmata*), a North American bird of the snipe family, also called Stone Curlew. It belongs to the tattler group, and is semi-palmate, its toes being half-webbed.

William I., king of England, called the Conqueror, bastard son of Robert III., Duke of Normandy, by Arletta, daughter of a tanner of Falaise, was born at Falaise in 1027 or 1028. News of his father's death on pilgrimage having reached Normandy in 1035, the nobles accepted him as duke. Many of them, however, rebelled against him, and were helped by his feudal superior, Henry I. of France. His guardians were faithful to him, but three of them were murdered, and his youth was passed in the midst of difficulty and danger. In 1047 the lords of the western, or Danish, part of the duchy rebelled, and William nearly fell into their hands at Valognes. King Henry came to his help, and the king and duke defeated the rebels at Val-ès-dunes. This victory established William's power in Normandy. He ruled his duchy vigorously, and won two fortresses on the frontier of Maine. In 1051 he visited his cousin, Edward the Confessor, the English king, and received from him a promise that he should succeed him in England. He married Matilda, daughter of Baldwin V., Count of Flanders, in 1053, though the marriage had been forbidden by the pope on the ground of consanguinity. Lanfranc, Abbot of Bec, reproved him for this marriage, and William ordered him to quit the duchy, but was quickly reconciled, and Lanfranc prevailed on the pope to confirm the marriage, William, as an atonement, building the abbey of St Stephen, and Matilda the abbey of the Holy Trinity, both at Caen. In the next ten years William repulsed two French invasions, and in 1063 conquered the county of Maine. Probably in 1064 Harold, Earl of Wessex, was at his court, and swore to help him to gain the English crown on Edward's death. When, however, Edward died, in 1066, Harold became king. William laid his claim before the pope and western Christendom; he was the last king's kinsman; Edward had promised him the crown; Harold had broken his oath. Warriors joined him from many lands; the pope approved his claim, and by sending him a consecrated banner invested his expedition with something of the character of a crusade. On 14th October he defeated Harold at the battle of Hastings, at a place called by one chronicler Senlac, where he afterwards built Battle Abbey. Harold was slain, and William, having received the submission of the English nobles, was crowned king on 25th December.

England, however, was not yet subdued, and, after a visit to Normandy, William set about completing the conquest. The west and north were subdued in 1068, but the next year the north revolted, and William cruelly devastated the whole country between York and Durham. In 1070 the conquest was completed. The king everywhere confirmed his power by building castles. Although the English generally were allowed to redeem their lands, those who resisted him suffered confiscation. With the confiscated lands he rewarded his followers, granting them to be held of himself. While William made little formal change in the law, the constitution under him assumed a feudal aspect, the old national assembly becoming a council of the king's tenants-in-chief. But he was careful to guard against the evils of continental feudalism; all title to land was originally derived from his grant; he distributed his grants to his great lords over several counties, and in 1086 he exacted an oath of fealty from all landowners, whether holding immediately of him or of other lords. Domesday Book, compiled by his order in that year, contains the record of the land settlement, and of the value of the land for fiscal purposes. The chief result of William's system was a large increase in the power of the crown. He brought the English Church into closer relations with Rome, using the papal authority to forward his own policy with respect to it, while he resisted all interference derogatory to his sovereignty, laying down rules defining the rights of the crown with reference to the papacy, and refusing a demand of homage made by the pope. The intimate union between the church and state in matters of jurisdiction and legislation characteristic of the old English system was abolished, church synods were frequently held, and ecclesiastical causes were removed from the sphere of the lay courts. William's policy, which was ably carried out by Lanfranc, Archbishop of Canterbury, while raising the character of the church, gave the papacy a stronger hold upon it, and tended to endanger the royal authority over it should the throne be occupied by a less capable ruler, or should a dispute arise between the church and the crown. The Conqueror, however, was supreme both in church and state. His rule was stern and orderly; he was greedy of money, and, though not wantonly cruel, careless of human suffering. All offences were severely dealt with, and mutilation was frequently inflicted, but he forbade capital punishment.

Revolts were made against William both in England and on the Continent. In 1070 there was a rebellion in the Fen Country; the hopes of the rebels were excited by the coming of a Danish fleet, and under the leadership of Hereward they for some time defended the Isle of Ely against the king. English exiles were sheltered by the Scottish king Malcolm, who plundered the northern shires; but William in 1072 crossed the Forth, and compelled Malcolm to make peace and to do him homage at Abernethy. In 1073 he reconquered Maine, which had revolted from him. During his absence in Normandy in 1075 the foreign earls of Hereford and Norfolk rebelled, and a Danish fleet appeared in the Humber. The English, however, were faithful to the king, and the rebellion was quickly suppressed. Waltheof, the English earl of Northumbria, had for a moment been implicated in the plot, and William, who put no one else to death for a political offence, had him beheaded. He made a successful expedition into South Wales, penetrating as far as St Davids. In his later years he engaged without success in some small wars in France. His eldest son, Robert, rebelled against him in Normandy in 1079, defeated and wounded his father at Gerberoi, and went off into France. Having entered on a war with Philip I. of France in 1087, William burned Mantes. As he rode through the burning town his horse stumbled, and he received an injury of which he died at Rouen on 9th September. He left Normandy to his son Robert, declared his wish that his next surviving son William should succeed him in England, and gave his youngest son Henry a sum of money. He was buried in the abbey church that he had built at Caen (q.v.).

See 'William of Poitiers,' 'William of Jumièges,' and 'Orderic,' in Duchesne's *Hist. Normann. Script.*; *Saxon Chronicle*, ed. by Plummer; William of Malmesbury's

Gesta Regum (Rolls series); *Roman de Rou; Regesta Willelmi Conquestoris*, ed. Davis; and modern authors—Freeman's *Norman Conquest*, ii. iii. iv., and *William the Conqueror*, in 'Twelve English Statesmen' series; Palgrave's *England and Normandy*, iii.; Stubbs's *Const. Hist.*, i.; Gneist's *Const. Hist.*, i.; Round's 'Introduction of Knight Service' in *Engl. Hist. Rev.*, Nos. 23, 24, 25; F. M. Stenton's *William the Conqueror* (1908). See also BAYEUX TAPESTRY, DOMESDAY, FEUDALISM, HAROLD, HASTINGS, LANFRANC.

William II., king of England, called Rufus, third, and second surviving, son of William the Conqueror, was born before 1066. On his father's death in 1087 he was crowned king at Westminster. The next year many of the Norman nobles in England, with the king's uncle Odo, Bishop of Bayeux and Earl of Kent, at their head, rebelled against him, in favour of his eldest brother Robert, Duke of Normandy; for they knew that Rufus would be a stern master, whereas in Robert they would have a king that would not trouble himself to enforce order. Rufus appealed to the English people for help, promising them good government and a relaxation of the forest laws and of fiscal burdens. They flocked to his standard, the bishops upheld his cause, and the rebellion was suppressed. He did not keep his promises; he taxed the people heavily, maintained the forests, and punished offences against the forest laws with death. He was an able man and a strong ruler, but was violent, boastful, profane, and unspeakably immoral. Always full of magnificent designs, he lacked stability of purpose, and consequently his achievements, though great in themselves, fell short of his plans. He largely employed mercenary soldiers, and allowed them to ill-use his people. By the agency of his justiciary, Randolf Flambard, he oppressed his tenants-in-chief by abusing his rights as feudal lord, making them pay him excessive sums by way of 'relief' on entering on their estates, and so on. The lesser people groaned under the harsh administration of the law, and seem to have had to suffer to make good what the king took from their lords. Treating ecclesiastical benefices as far as possible like lay fiefs, Rufus sold them, and kept them vacant, seizing their revenues during vacancy. Besides other bishoprics the see of Canterbury had been vacant for four years when, in 1093, he fell sick, repented, and appointed Anselm, a holy and learned man, to the archbishopric. When Rufus recovered he resumed his evil life, and quarrelled with Anselm because he maintained the rights and liberties of the church. At the Council of Rockingham, where in 1095 the king tried to crush his resistance, the primate, though deserted by his suffragans, was defended by the lay lords; but in 1097 Anselm, despairing of justice in England, departed to lay his cause before the pope, and did not return again until after the king's death.

Mindful of the trouble that Robert had brought upon him in England, Rufus made war upon him in Normandy, where the duke's lax rule had led to much confusion. Peace was made in 1091, and the duke and king joined in besieging their brother Henry in Mont St Michel, and forced him to surrender. In 1094 Rufus again invaded Normandy, which was rent by private wars. Impatient of his strong rule, some Norman lords in England, headed by Robert of Mowbray, Earl of Northumberland, raised a rebellion against him at home, which was speedily crushed. His power was strengthened in 1096 by the acquisition of Normandy, which was mortgaged to him by the duke, and which he soon brought into order. The feudal lords in England were no longer able to expect help against him from Normandy, and he gained a double hold over such of them as had lands on both sides of the Channel. The acquisition of Normandy led him to make an attempt to conquer the adjoining French district of Vexin, but in this he was unsuccessful. In 1098 he reconquered Maine, which Robert had lost. The next year its former count, Helias, recovered it, and Rufus, though he again invaded Maine and won back its capital, Le Mans, did not complete the reconquest of the county. This was characteristic of him; he had wonderful energy, but little perseverance, and after entering on a war with vigour would let it die out before he had fully accomplished his purpose. At home he enlarged his kingdom by the conquest of Carlisle and its district from its Scandinavian lord. This conquest probably offended Malcolm, king of Scotland, who invaded Northumberland in 1093, and was slain at Alnwick. Rufus upheld the right of Malcolm's eldest son Duncan, who had lived at his court, against his uncle, and later favoured the cause of Duncan's half-brother Edgar, who, after gaining the kingdom, remained on good terms with England. Rufus thrice invaded Wales, twice with signal ill-success, and, finding that he could not subdue it by leading an army against it, built castles on the borders. The lords of the border castles kept up a continual warfare with the Welsh, conquering the land piecemeal without costing the king anything. Towards the end of the reign, however, the Welsh won back some districts that they had lost. In 1100 Rufus was planning the acquisition of Aquitaine, which its duke proposed to pledge to him. But as he was hunting in the New Forest on 2d August he was slain accidentally, as is most probable, by an arrow shot by one of his companions named Walter Tirel. He was buried in Winchester Cathedral without any religious service; for his wickedness had been great, and men looked on his death as a judgment of God. He was never married.

See 'Orderic,' ed. by Duchesne; Eadmer's *Hist. Nov.*, ed. by Migne; *Saxon Chronicle*, ed. by Plummer; 'Henry of Huntingdon' (Rolls series); William of Malmesbury's *Gesta Regum* (Rolls series); *Regesta Willelmi Rufi*, ed. Davis; and modern writers—Freeman's *Reign of William Rufus;* Lappenberg's *Norman Kings*, ed. by Thorpe.

William III., posthumous son of William II. of Orange (1626–50) by Mary (1631–60), the eldest daughter of Charles I. of England, was born at the Hague on 4th November 1650. The alliance of his house with the Stuarts aroused the jealousy of Cromwell; and by his influence the baby-prince and any of his lineage were declared to be excluded from the Stadhoudership of the United Provinces. The restoration of Charles II. in England improved his nephew's prospects; and on the murder of De Witt in 1672 (a murder at which William connived) he was chosen Stadhouder. The republic was at this time carrying on an apparently hopeless contest with its powerful neighbour, Louis XIV. of France; but by the valour and wisdom of the young Stadhouder, who announced his readiness 'to die on the last dyke,' the war was in 1678 terminated by the treaty of Nimeguen in a manner advantageous and honourable for the United Provinces. On 4th November 1677 William had married his cousin, the Princess Mary (born 30th April 1662), elder daughter by Anne Hyde of the Duke of York, afterwards James II.—a political match, which did not at first prove a happy one. Until the birth of her half-brother on 10th June 1688 Mary was heir to the English crown; naturally William gave no countenance to Monmouth's expedition (1685), and as naturally that birth was a blow to William's ambition and to his hopes of stemming the renewed aggression of France, against which with consummate diplomacy he had in 1686 formed a great European league. But James's tyranny was

estranging from him the affections of every class of his subjects; the eyes of all Englishmen were turning towards the Stadhouder as their only hope; and, on the day that the Seven Bishops were acquitted, seven Englishmen of high position, both Tories and Whigs, invited him to come over and redress their grievances. Having once formed his resolution, William conducted the operations with great secrecy and skill. On 5th November 1688 he landed at Torbay with an army of 15,000, composed of English and Dutch. His success was rapid and bloodless. Men of all parties came over to him; on 23d December James fled the kingdom; and, the throne having been declared vacant by the Convention Parliament, on 13th February 1689 William and Mary (she had landed the day before) were proclaimed king and queen of Great Britain and Ireland. The assembling of a free parliament had been, he professed, his sole object; but his acceptance of the warming-pan fiction, and his refusal to have any share in the government save as king in his own person and for the term of his life, sufficiently reveal his aims.

James's adherents held out for some time in Scotland and Ireland, but the fall of Dundee at Killiecrankie ended their resistance in the former country (July 1689), whilst in the latter their last stronghold, Limerick, had to surrender (October 1691). William thus was left free for his continental campaigns, in which, great soldier though he was, he found himself outmatched by Luxembourg. The latter's death in 1695 was a turning-point in the war, which yet was ended only by the peace of Ryswick (1697), a peace distasteful to William, but highly popular with his English subjects. In spite of his sterling qualities, and of the debt that they owed him, he and they were never in sympathy; his foreign birth, his reserve, his very ill-health were against him. The death by smallpox on 28th December 1694 of his wife, for whom, though not faithful to her, he sorrowed inconsolably, materially injured his position. His schemes were thwarted by parliament; continual plots for his assassination were hatched by James's adherents; and the death in 1700 of Charles II. of Spain, and the succession of Philip of Anjou, was another blow to his policy. He pursued it, however, with unflagging vigour till his death, which took place at Kensington on 8th March 1702. His horse (it had been Sir John Fenwick's) a fortnight before had stumbled over a molehill and thrown him: hence the Jacobite toast, 'To the little gentleman in black velvet.' During his reign the Bank of England was established, the modern system of finance introduced, ministerial responsibility recognised, the liberty of the press secured, and the British constitution established on a firm basis.

See the articles BANKING, BOYNE, DARIEN SCHEME, ENGLAND (*History*), FENWICK, GINCKELL, GLENCOE, HOLLAND (*History*), JACOBITES, JAMES II., LA HOGUE, LONDONDERRY, LOUIS XIV., MARLBOROUGH, NEERWINDEN, NONJURORS, RIGHTS (DECLARATION OF), SCHOMBERG, SCOTLAND, SENEFFE, STEINKERK, &c.; the Histories of Burnet and Macaulay; Traill's *William III.* (1888); *The Age of Louis XIV.* in the 'Cambridge Modern History' (1908); Lodge in vol. viii. of *The Political History of England* (1910).—William, though he treated his wife with less than kindness or even loyalty, thought that if any mortal could be born without sin it was the queen—a woman of blameless life, and unassuming but solid intellectual capacity. See her autobiographical *Memoirs* (ed. Doebner, 1885), and Miss Sandars's Life of her (1913).

William IV., the 'sailor-king,' was born at Buckingham Palace on 21st August 1765. The third son of George III., he entered the navy as a midshipman in 1779, and, having seen some service off the coast of America and in the West Indies (he was the first English prince that visited the New World), in 1785 was promoted to lieutenant, and in 1786 to captain. In June 1789, having a year and a half before returned from Halifax to England without leave, he was created Duke of Clarence and St Andrews and Earl of Munster, with an allowance from parliament of £12,000 a year; but his professional career was at an end, although he was formally promoted through the successive ranks to that of Admiral of the Fleet (1811), and although during 1827–28 he held the revived office of Lord High Admiral. From 1790 to 1811 he lived with the actress Mrs Jordan (q.v., 1762–1816), who bore him five sons and five daughters; on 13th July 1818 he married Adelaide (1792–1849), eldest daughter of the Duke of Saxe-Meiningen. Of the two daughters born of this marriage in 1819 and 1820, one lived but a few hours, and the other only three months. By the Duke of York's death in 1827 the Duke of Clarence became heir-presumptive to the throne, to which he succeeded at the death of his eldest brother, George IV., on 26th June 1830. A steady Whig up to his accession, he then naturally turned Tory, and did much to obstruct the passing of the great Liberal measure of his reign, the first Reform Act (1832). The abolition of colonial slavery (1833), the reform of the poor-laws (1834), and the Municipal Reform Act (1835) were immediate results of that great constitutional change. The plain, bluff king, whose eccentricity it was at one time feared would end in insanity, died at Windsor, after a short illness, on 20th June 1837, and was succeeded by his niece, Queen Victoria.

See (besides the articles on his premiers, GREY, MELBOURNE, and PEEL, with works there cited) the Duke of Buckingham's *Courts and Cabinets of William IV. and Victoria* (2 vols. 1861); the *Greville Memoirs;* Percy Fitzgerald's *Life and Times of William IV.* (2 vols. 1884); and Molloy's *Sailor King* (1903).

William the Lyon, king of Scotland, was born in 1143, a grandson of David I., and brother of Malcolm IV., whom he succeeded in 1165. Whence he derived his designation is one of the mysteries of history. When heraldry long afterwards became a science, and was supposed to have been in use earlier than it really was, it was not unnaturally supposed that he was the first king who used, as a heraldic achievement, the lion, afterwards the chief feature in the arms of Scotland. His predecessors had long contested with the kings of England the sovereignty of Northumberland and other districts of what is now the north of England. Under Malcolm these claims were virtually abandoned, and the king of Scots received, as a sort of equivalent for them, the earldom of Huntingdon and other valuable estates, holding of the English crown. William had still, however, a hankering after the Northumbrian districts. He attended Henry of England in his continental wars, and is supposed, when doing so, to have pressed for a portion at least of the old disputed districts. In his disappointment he invaded them after the example of his ancestors. On the 13th July 1174 he fell, near Alnwick Castle, into the hands of an English party. For security he was conveyed to Normandy, and there he consented, as the price of his liberation, to perform that homage for his kingdom which the English kings so long in vain attempted to exact from the government of Scotland. How far the Scots community would have admitted that he had a right to bind them in such a condition may be doubted. The treaty of Falaise, however, as the transaction was termed, from the place where it was adjusted, was revoked in the year 1189 by Richard I. of England in consideration of a payment of 10,000 marks, which he wanted for his celebrated expedition to Palestine. William had several disputes

with the church, but he was one of the early benefactors of the regular ecclesiastics, and founded in 1178 the great abbey of Arbroath, which he dedicated to Thomas Becket, slain eight years earlier. William died at Stirling in 1214. See Lawrie, *Annals, 1153–1214* (1910).

William the Silent, Prince of Orange (1533–84), was the means of freeing the Netherlands from the Spanish yoke, and his biography is interwoven with the history of Holland (q.v., *History*). See also the works cited at the end of that article; and books on William himself in English by F. Harrison (1897), R. Putnam (1895, 1911); in German by Klose (1864), Kolligs (1885), and Rachfahl (1906–8); in French by Juste (1874). His correspondence was edited by Gachard (Brussels, 1847–66).

William I., seventh king of Prussia, and first German emperor, was the second son of Frederick-William III. and his queen Louisa, of Mecklenburg-Strelitz. He was born on the 22d of March 1797, in the palace at Berlin. Although he lived to a great age, he was very delicate in his childhood, and was reared with difficulty. At Christmas 1803 he donned the military uniform of one of the celebrated regiments, later known as the Red Hussars. The prince's education was entrusted first to Privy-councillor Dellbrück and afterwards to Professor Reimann; and in the science of war he had the benefit of the tuition of Generals Von Scharnhorst and Von Knesebeck. His instructor in law was the celebrated international jurist De Savigny; and he took lessons in the plastic arts from Rauch, the sculptor, and Schenkel, Berlin's greatest architect. He formally entered the army in January 1807, and within a year got his first promotion. He received constant instruction in military tactics; and in 1814 the prince crossed the Rhine in the staff of his father, and on the 27th of February received his 'baptism of fire' on French territory, at Bar-sur-Aube. He behaved with such gallantry that the emperor of Russia conferred upon him the Cross of St George, while the king of Prussia awarded him the Iron Cross. As his military career began with the 1814 campaign against the first Napoleon, so was it destined to close with the campaign of 1870–71 against the third Napoleon. The prince entered Paris with the allies on the 31st of March 1814.

Prince William was made a privy-councillor in 1817, and in the following year, on attaining his majority, he was advanced to the rank of a major-general in the army. During the king's absence in Russia he was entrusted with the charge of the whole Prussian military department. In 1825 he went to St Petersburg, conveying the king of Prussia's congratulations to the Tsar Nicholas on his accession. In June 1829 the prince was married to the Princess Augusta of Saxe-Weimar. By the accession of his brother, Frederick-William IV., in 1840, he became heir-presumptive, and assumed the customary title of Prince of Prussia. In 1844 he visited England, and formed a friendship with Queen Victoria and the Prince Consort, which was cemented by several subsequent visits. During the revolutionary events of 1848 the Prince of Prussia's attitude towards the people was severely criticised, and for a time he was very unpopular at Berlin. He was obliged to quit Prussia, and, proceeding to London, took up his quarters at the Prussian Legation. In two months, however, he received his recall. As deputy for the district of Wirsitz he defended his conduct and policy in the first National Assembly. In 1849 he subdued the disaffection in Baden. In 1855 he presided over the military commission which decided upon the adoption of the needle-gun throughout the Prussian army; and on the 1st of January ensuing he celebrated his fifty years of military service. In 1858 his son, Frederick-William (see FREDERICK III.), married the Princess Royal of England, and the same year the Prince of Prussia received and entertained Queen Victoria and Prince Albert on their visit to Germany. In consequence of the prolonged disablement through paralysis of the king of Prussia, the prince was formally appointed regent of the kingdom, October 7, 1858. He carried out searching army reforms, and took an active share in European diplomacy. On the 2d of January 1861 Frederick-William IV. expired at Sans Souci, and the Prince of Prussia succeeded to the throne as William I. Great hopes were entertained of a more liberal policy than was favoured by the deceased monarch, but King William soon manifested his intention of consolidating the throne and strengthening the army rather than launching forth upon a career associated with popular progress. A few months after his accession the king narrowly escaped assassination at the hands of a Leipzig student named Oscar Becker.

Determined to press forward his new scheme for increasing the army, and making its strength immediately available, the king discovered in Prince Bismarck (q.v.) an able instrument for effecting his purposes. Bismarck was placed at the head of the ministry, with Roon—the author of the new army system—as war minister. The scheme was very unpalatable to the parliament, but the minister-president forced it upon the nation, with the necessary increased expenditure, by overriding the constitution. In 1864 the Sleswick-Holstein difficulty led to a war with Denmark (q.v.), in which the Prussian and Austrian troops were victorious; and in 1866 the two allied powers quarrelled over the spoils, and struggled for the supremacy amongst the German states. Austria (q.v.) was crushed by the battle of Sadowa, which closed the Seven Weeks' War, and Prussia gained in territory and prestige by her victories. France, alarmed by the growing ascendency of Prussia in Europe, endeavoured to form a confederacy of the South-German states, but the project failed. The affair of the duchy of Luxemburg nearly led to a war between France and Prussia in 1867, but the difficulty was adjusted by the treaty of London, which declared the duchy to be a neutral state. Shortly afterwards King William and Prince Bismarck visited the Emperor Napoleon at Paris, the Great Exhibition furnishing the occasion for this peaceable *réunion*. In 1870, however, the inevitable struggle between France and Prussia was precipitated. The Spanish throne having become vacant, Prince Leopold, son of the Prince of Hohenzollern-Sigmaringen, was put forward as a candidate. The prince agreed to accept the Spanish crown if the Cortes chose him. As King William was the head of the House of Hohenzollern, this gave great umbrage to the war party in France, who bitterly denounced Bismarck as the promoter of Prince Leopold's candidature. Although the candidature was withdrawn, Napoleon III. still forced a quarrel on Prussia (at least it was made to appear so by the rather unscrupulous diplomacy of Bismarck) by making impossible demands upon the king, and war was declared between the two countries. William took the field on 31st July, and issued a proclamation affirming that a neighbouring state had declared war against Prussia without any cause. The French forces were defeated almost everywhere with great slaughter; Napoleon capitulated at Sedan; and by the end of September the city of Paris was invested. While William was at Versailles in December, the North-German parliament, together with the princes of

Germany, pressed upon him the acceptance of the imperial crown of Germany, and on the 18th of January 1871 he was proclaimed emperor. Peace was signed on 26th February—Germany receiving a large war indemnity and recovering Alsace and Lorraine; and on 1st March the German troops entered Paris.

Interviews between the German and Austrian emperors in August–September 1871 were supposed to indicate the formation of an Austro-German alliance, which was strengthened by the adhesion of the czar in 1873. The Emperor William visited Victor Emmanuel at Milan in 1874; and the peace of Europe was further assured by the strict neutrality of Germany during the Russo-Turkish war of 1876–77. During this period the emperor and Prince Bismarck were engaged in consolidating the fabric of Teutonic unity. For some years, nevertheless, there was great friction between the Vatican and the court of Berlin on the question of the imperial jurisdiction over German Catholic subjects; but on the accession of Pope Leo XIII. a more amicable spirit prevailed, and the dispute was finally closed in 1883 by concessions to the ultramontane party. The rapid rise of Socialism in Germany led to severe legislative measures, and in 1878 the emperor's life was twice attempted by adherents of the Socialist party—first by a mechanic named Max Hödel, and secondly by Dr Karl Nobiling. On the latter occasion the aged emperor was seriously wounded, but he recovered his health in a surprising manner.

The emperor celebrated his golden wedding June 11, 1879. On the 15th of October 1880 he was present at the opening of Cologne Cathedral, and on the 28th of September 1883 he unveiled the great national monument on the Niederwald, near Rudesheim. Here another attempt was made upon his life, which was followed by still more stringent measures against the Socialists. The ninetieth anniversary of the emperor's birth was celebrated with great rejoicings throughout Germany on the 22d of March 1887. The veteran monarch, however, did not long survive the celebration, as he died on the 9th of March 1888. William I., though holding tenaciously to the prerogatives of the kingly office, was of a simple and unassuming personal character. He was frank, open-hearted, generous, sincere, and pious; withal he had an inflexible will, and high moral and physical courage. Humane and magnanimous, he was a born ruler of men.

See E. Simon, *The Emperor William and his Reign* (trans. from the French, 1886); G. B. Smith, *William I. and the German Empire* (1887); Schneider, *Aus dem Leben Kaiser Wilhelms* (3 vols. 1888); A. Forbes, *Life of Emperor William* (1889); S. Whitman, *Imperial Germany* (1891); W. Oncken, *Das Zeitalter des Kaisers Wilhelm* (2 vols. 1892); E. Marcks, *Kaiser Wilhelm* (1900); Pfister, *Kaiser Wilhelm und seine Zeit* (1906). *Politische Korrespondenz* appeared in 1890, *Briefe, Reden und Schriften* in 1906, *Briefe* in 1911, while the Bismarck Correspondence was translated into English, 1903.

William II., third German emperor and ninth king of Prussia, was born at Berlin, 27th January 1859, the son of the Crown-prince Frederick and the Princess Victoria (Princess Royal) of England. After a careful home education, he studied at the gymnasium in Cassel, passing the leaving examination. He also underwent a systematic and very thorough military training, and was early drilled in administrative methods and governmental usages. In spite of an accident at his birth which permanently weakened his left arm, he became an admirable horseman and an indefatigable hunter. He is also an enthusiastic yachtsman. Called to the throne by the death of his father, Frederick III., in 1888 (when his mother, three months an empress, retired into private life), he showed in all departments of imperial government, in all that concerned foreign relations, in the management of army and navy, an irrepressible and exuberent energy. He startled Europe by speeches in which he indicated a very exalted notion of his imperial responsibility, and intimated his resolve to maintain the high monarchical traditions of the Hohenzollern house. He made a series of tours to foreign courts—St Petersburg, Copenhagen, Rome, &c.—and early showed himself to be restless, capricious, and strong-willed, with an overweening sense of the divine right of his imperial power, while his autocratic attitude led to the enforced resignation of Bismarck (q.v.) in 1890. He often spoke very unadvisedly on public occasions, and a conscious posing became characteristic of his temperament. At once a lord of hosts, a yachtsman, a poet, a composer, a painter, and a preacher (and for long under the dilettante influence of Prince Philipp Eulenburg), he had to endure the defeat or withdrawal of several favoured schemes as reactionary or impossible—a religious education bill, several anti-Socialist measures, and a vast increase of the fleet. The course of public events has been sketched at GERMANY (*History*)—the succession of chancellors, the increase of the army, the growth of trade and commerce, colonial expansion, an aggressive policy in Morocco, the Balkans, the East, &c., and prosecutions for lese-majesty. In connection with his strenuousness in combating Socialism, a crisis arose in 1908, but with the resignation from the chancellorship of Bülow (q.v.) the next year, the military power in Germany definitely gained the ascendancy. The embitterment of relations with England first showed itself in the telegram despatched to Kruger after the Jameson Raid (1896), and was later emphasised by the building of huge naval armaments. By the friendly attitude of Germany towards Turkey the concert of Europe was hampered, but the Triple Alliance was formally maintained, till Italy broke away in May 1915. In the events of 1914 the emperor vacillated between peace and war (see WORLD WAR). On 10th November 1918, after defeat had brought revolution to Germany, he abdicated, and fled to Amerongen in Holland, later living at Doorn, near Utrecht. A republic was set up in Germany. The emperor married in 1881 Princess Augusta Victoria of Sleswick-Holstein (1858–1921), and in 1922 Princess Hermine of Reuss. By the first marriage six sons and a daughter were born; the eldest son, William (born 1882), married the Duchess Cecilia of Mecklenburg-Schwerin in 1905, and has four sons and two daughters. The emperor's sister, Sophia, married Constantine, king of Greece.

The speeches of William II. covering the years 1888–1905 were collected by Penzler (3 vols.), and from 1906–14 by Krieger (4 vols.), and a selection was translated into English (1 vol. 1904). His *Memoirs, 1878–1918*, appeared in 1922, and *My Early Life* in 1926 (both trans. into Eng.). See books on the emperor in English by Perris (1912), Morton Prince (1915), Hill (1919); in German by 'Schwarzscher' (1906), Rathenau (1919), Ludwig (1926); in French by Mazel (1919); also the writings of Bismarck, Hohenlohe, Tirpitz, Ludendorff, A. von Waldersee, &c.

William and Mary College, next to Harvard College, the oldest institution of learning in America, was established at Williamsburg, Virginia, in 1693. It became the wealthiest college of America, but at the Revolution it lost most of its possessions, and again during the civil war much of its property was destroyed. In 1888 it suspended work, but an indemnity by congress in 1893 and an annual appropriation enabled it to resume.

William of Champeaux. See SCHOLASTICISM.

William of Malmesbury. See MALMESBURY.

William of Newbury, chronicler, one of the chief authorities for the reign of Henry II., was a native of Bridlington in Yorkshire, and lived from *c.* 1135 to *c.* 1200. His *Historia Rerum Anglicarum* is divided into five books, extending from the year 1066 to 1198. It is clear, sound, and unprejudiced, the characters drawn with discrimination, and the narrative is especially valuable as an authority on the struggle between Becket and the king. It was edited by Hans Hamilton (2 vols. 1856), and by R. Howlett (Rolls Series, 1884–85).

William of Tyre, historian, was probably born about 1137, but at any rate was appointed archdeacon of Tyre in 1167, and archbishop of Tyre in 1175. He was tutor to Baldwin, son of king Amalric, and was one of the six bishops who represented the Latin Church of the East at the Lateran Council (1179), and on the return journey spent some months with the Emperor Manuel at Constantinople. His history breaks off abruptly about the end of 1183. William of Tyre's *Historia Rerum in Partibus Transmarinis Gestarum* worthily fills up the space between the periods treated by Fulcher of Chartres and Ernoul, that is from 1127 to 1184. There is a 13th-century French translation, edited by P. Paris (2 vols. 1879–80), often styled *Roman d'Eracle*, simply because the name of Heraclius occurs in the first sentence. Another work was the *Historia de Orientalibus Principibus*, undertaken at the request of Amalric. As a historian William of Tyre is painstaking, learned, unprejudiced, with the gift moreover of graphic delineation.

William of Wykeham. See WYKEHAM.

Williams, ISAAC, Tractarian, was born on 12th December 1802 at Cwmcynfelin near Aberystwith, his maternal grandfather's home, and was brought up in London, his father being a Chancery barrister. He was educated at Worpleston near Guildford, at Harrow, and at Trinity College, Oxford; in 1822 made the acquaintance of Keble, and through him of Hurrell Froude; and in 1829 was ordained to the Oxfordshire curacy of Windrush. Elected in 1831 a fellow of his college, he was subsequently curate to Newman, and at Bisley; in 1842 stood unsuccessfully for the Oxford chair of Poetry; and for seventeen years lived at Stinchcombe, Gloucestershire, where he died, 1st May 1865. His works, nearly thirty in number, were chiefly religious poetry; but the most noteworthy was Tract 80, on 'Reserve in Religious Teaching.' See his *Autobiography* (1892).

Williams, JOHN, missionary martyr, was born at Tottenham, near London, 29th June 1796. At fourteen he was apprenticed to an ironmonger, but having offered himself to the London Missionary Society, was sent in 1816 to Eimeo, one of the Society Islands. Later he settled in Raiatea, the largest of the group, and laboured here with marvellous success, his powers of organisation being as conspicuous as his zeal. In 1823 he went to Raratonga, the chief of the Hervey Islands, and ere long the whole group was Christianised. He next built a boat 60 feet long and 18 wide, the sails of native matting, the cordage of the bark of the hibiscus, the oakum of coconut husks and banana stumps, and in this vessel during the next four years he visited many of the South Sea Islands, extending his missionary labours to Samoa. In 1834 he returned to England, and remained nearly four years, superintending the printing by the Bible Society of his Raratongan New Testament, and raising £4000 to equip a missionary-ship for Polynesia. In 1838 he went out again, visited many of the stations he had already established, and sailed as far west as the New Hebrides, where he hoped to plant a mission, but was killed and eaten by the savage natives of Erromango, 20th November 1839. He published his *Narrative of Missionary Enterprises* in 1837. See the Memoir by Rev. Ebenezer Prout (1843), and a popular Life by B. Mathews (1915).

Williams, SIR MONIER MONIER-, Sanskrit scholar, was born at Bombay, 12th November 1819, and educated at King's College, London, and Balliol and University Colleges, Oxford, taking the Boden scholarship in 1843, and graduating B.A. in 1844. He was professor of Sanskrit at Haileybury (1844–58), and a master at Cheltenham (1858–60), when he was appointed Boden professor of Sanskrit at Oxford. Knighted in 1886, at the opening of the Indian Institute established mainly through his energy, he died 11th April 1899.

His books include, besides his last work, on Haileybury College (1894), Sanskrit grammars (1846, 1860) and dictionaries (1851, 1872, 1899), the *Sakuntalâ* (1853) and other Sanskrit texts, *Rudiments of Hindustani* (1858), *Indian Epic Poetry* (1863), *Indian Wisdom* (1875), *Hinduism* (1877), *Modern India and the Indians* (1878), *Religious Thought and Life in India* (1883), *The Holy Bible and the Sacred Books of the East* (1887), and *Buddhism in its connection with Brahminism and Hinduism, and in its Contrast with Christianity*—the Duff Lectures (1889).

Williams, ROGER, founder of the state of Rhode Island, and one of the apostles of Toleration, was born about 1600, somewhere in Wales. In his youth he went up to London and attracted the attention of Sir Edward Coke by his shorthand notes of sermons and of speeches in the Star-chamber, and was sent by him in 1621 to Sutton's Hospital (now the Charterhouse School). It is most probable that thereafter he studied at Pembroke College, Cambridge; and he was afterwards admitted to orders in the Church of England, but soon became an extreme Puritan, and emigrated to New England, arriving at Boston in February 1631. He refused to join the congregation at Boston, because the people would not make public declaration of their repentance for having been in communion with the Church of England; he therefore went to Salem, as assistant-preacher, but was soon in trouble for denying the right of magistrates to punish Sabbath-breaking and other religious offences, as belonging to the first table of the Law. For his opposition to the New England theocracy he was driven from Salem, and took refuge at Plymouth, where he studied Indian dialects. Two years later he returned to Salem, only to meet renewed persecution and banishment from the colony, for denying the right to take the Indians' lands without purchase, and the right to impose faith and worship. He held that it was not lawful to require a wicked person to swear or pray, which were both forms of worship; and that the power of the civil magistrate extends only to the bodies, goods, and outward state of men, and not to their souls and consciences. Banished from the colony in 1635, and threatened with deportation to England in order to prevent the infection of his pernicious doctrine of toleration from spreading, he escaped in midwinter to the shores of Narragansett Bay, accompanied by a few adherents, where he purchased lands of the Indian chiefs, founded the city of Providence (June 1636), and established a government of pure democracy. Having adopted the belief in adult baptism of believers by immersion, Williams was baptised (1639) by a layman, and then baptised him and ten others, thus founding the first Baptist church in America. Later he doubted the validity of this baptism, and withdrew from the church he had founded. In 1643 he came to England to procure a charter for his colony, and

published a *Key into the Language of America* (1643), and *The Bloudy Tenent of Persecution for Cause of Conscience Discussed* (1644), in which the right to religious freedom is argued in a dialogue between Truth and Peace. The chief attempt at an answer he replied to later with *The Bloudy Tenent yet more bloudy by Mr Cotton's Endeavour to wash it White in the Blood of the Lamb* (1652). After going back to Rhode Island, he returned a second time to England on business of the colony in 1651, when he published *Experiments of Spiritual Life and Health, and their Preservations*, dedicated to Lady Vane, and *The Hireling Ministry none of Christ's*. At this period he engaged in an experiment of teaching languages by conversation, and made the acquaintance of Milton, who speaks of him as 'that noble confessor of religious liberty.' He returned to Rhode Island in 1654, and was president of the colony from that year till 1658. He refused to persecute the Quakers, but engaged in 1672 in a famous controversy with them—recorded in *George Fox digged out of his Burrowes* (Boston, 1676). He died in 1683.

See Memoirs by James D. Knowles (Boston, 1834), William Gammell (Boston, 1845), Romeo Elton (Lond. 1853), Reuben A. Guild (1866), H. M. Dexter (1876), and O. S. Straus (1894). His Letters were edited by J. Russell Bartlett (Providence, 1882); his Works by the Narragansett Club (6 vols. 4to, Providence, 1866–74).

Williams, ROWLAND, Liberal divine, was born at Halkyn in Flintshire, August 16, 1817, and had his education at Eton and King's College, Cambridge. He became fellow, and later tutor, of his college, and in 1850 was appointed vice-principal and professor of Hebrew at Lampeter College. In 1859 he was presented to the vicarage of Broad-Chalke near Salisbury, and hither he retired in 1862 after the storm caused by his contribution, 'Bunsen's Biblical Researches,' to *Essays and Reviews*. He was tried by the Canterbury Court of Arches, and sentenced to suspension for one year, but the Privy-council reversed the judgment. He died 18th January 1870.

His chief books are *Christianity and Hinduism* (1856); *Rational Godliness* (1855); *Broad-Chalke Sermon-Essays* (1867); *The Hebrew Prophets*, translated afresh (2 vols. 1868–71); *Psalms and Litanies* (1872). See the Life by his widow (2 vols. 1874).

Williams, SIR WILLIAM FENWICK (1800–83), general, was born at Annapolis, Nova Scotia, entered the engineers, and was employed in diplomatic work in Turkey. During the Crimean War, as British Commissioner, he thoroughly reorganised the Turkish army in Asia, and became famous for his heroic defence of Kars (q.v.), June till November 1855, when famine forced him to surrender. Subsequently he held commands in Canada and in Gibraltar.

Williamsburg, the oldest incorporated town of Virginia, and capital of James City county, lies near the James River, 48 miles by rail ESE. of Richmond. Here are William and Mary College (q.v.) and the Eastern State Lunatic Asylum. Founded in 1632, it was the colonial and state capital till 1779. The town was taken by McClellan after severe fighting on May 5–6, 1862. Pop. 2500.

Williams College, a college at Williamstown, Massachusetts, was founded as a free school by a bequest of Colonel Ephraim Williams in 1755, and incorporated in 1793. The Hopkins Observatory here was the first in America.

Williamson, ALEXANDER WILLIAM, chemist, was born in London, 1st May 1824, studied at home, at Paris, and at Giessen, and in 1849 became professor of Practical Chemistry at University College, London, as also in 1855 of Chemistry; he resigned in 1887. He was twice president of the Chemical Society, and president of the British Association in 1873. A memoir on *Etherification and the Constitution of Salts* (1850) had a great influence on the theories of chemical action, and he received numerous distinctions for his researches. He published many papers and lectures, and a well-known *Chemistry for Students*. He died 6th May 1904.

Williamson, WILLIAM CRAWFORD (1816–95), naturalist, was born at Scarborough, acted as curator of the Manchester museum (1835–38), and in 1840 graduated in medicine at University College, London, specialising later in aural surgery. He was professor of Botany at Owens College, Manchester (1851–92), and gave many lectures throughout the country. His researches in zoology, geology, and especially palæobotany, were both numerous and valuable. See his *Reminiscences of a Yorkshire Naturalist* (1896).

Williamsport, capital of Lycoming county, Pennsylvania, on the west bank of the Susquehanna (here crossed by a suspension bridge), 93 miles by rail N. of Harrisburg. It is a popular summer-resort, and the chief lumber mart of the state, producing also coal, engines, boilers, and other iron and steel manufactures, sewing-machines, agricultural implements, leather, glass, silk, furniture, rubber goods. Pop. (1920) 36,198.

Williamstown, a suburb of Melbourne (q.v.), Victoria.

Willibrod, or WILBRORD, the apostle of the Frisians, was born in Northumbria about 658, became a Benedictine and scholar of Egbert, and was sent about 690 as missionary to Friesland. He went first to Rome to get the papal benediction, was made Bishop of Utrecht, and laboured with the utmost zeal and success till his death in the abbey of Echternach, 7th November 739. See his Life by Alberdingk Thijm (Münster, 1863); and Ebrard, *Die Iro-Schottische Missionskirche* (1873).

Willimantic, a city of Connecticut, 31 miles by rail E. by S. of Hartford, with important manufactories of cotton, silk, wool, small tools, &c., dependent on the power supplied by the Willimantic River, which here falls 100 feet in 1 mile; pop. (1920) 12,330.

Willis, JOHN CHRISTOPHER, botanist, born at Birkenhead, 20th February 1868, a relative of N. P. Willis, studied at Liverpool and Cambridge, was a university assistant in botany in Glasgow, director of the botanical gardens at Peradeniya (1896–1911) and at Rio de Janeiro (1912–15). Besides writings on agriculture he is the author of *Flowering Plants and Ferns* (new. ed. 1925), a useful pocket-companion in the botanic garden or library, and *Age and Area* (1922), an important study of geographical distribution in relation to evolution.

Willis, NATHANIEL PARKER, American author, was born at Portland, Maine, 20th January 1806. He came of a race of printers and publishers; his father founded the *Youth's Companion* (1827). He studied at Yale, issued several volumes of poetry, and established the *American Monthly Magazine*, afterwards merged in the *New York Mirror*, in which he was associated with George P. Morris. In 1831 he visited Europe, and contributed to the *Mirror* his *Pencillings by the Way*. Appointed *attaché* to the American legation at Paris, he had favourable opportunities for observing European society, and after a visit to Greece and Turkey returned to England in 1837, and married a daughter of a British officer, General Stace. He contributed to the London *New Monthly* his *Inklings of Adventure* (republished 1836), and returned to New York and published *Letters from Under a Bridge* (1840). In 1844 he engaged with General Morris in editing

the *Daily Mirror*, his wife died, and he revisited Europe, and published *Dashes at Life with a Free Pencil* (1845); returned to New York in 1846, he married a daughter of the Hon. Joseph Grinnell of New Bedford, and with his former partner established the *Home Journal*, to which he contributed most of the following works, also published in a collected form: in 1850, *People I have Met* and *Life Here and There;* 1851, *Hurry-graphs, Memoranda of a Life of Jenny Lind;* 1853, *Fun Jottings, A Summer Cruise in the Mediterranean;* 1854, *A Health-trip to the Tropics, Famous Persons and Places, Outdoors at Idlewild;* 1855, *The Rag-bag;* 1857, *Paul Fane;* 1859, *The Convalescent.* Thackeray contributed to his paper the *Mirror.* Much of this work was done during a long, brave struggle with what appeared to be consumptive disease. Willis was an observant and thoughtful writer, discursive, fragmentary, picturesque, sprightly, quaint, and graceful, full of elaborate ease and ingenious spontaneity. He died at Idlewild, near Cornwall-on-the-Hudson, 20th January 1867. See Life in 'American Men of Letters' series (1885), by H. A. Beers, who also edited *Selections* from his prose-writings (1885).—His sister, Sarah Payson Willis (1811–72), was a popular writer under the pen-name of 'Fanny Fern.' See *Fanny Fern, a Memorial Volume* (1873), by her husband, James Parton, an industrious journalist and compiler.

Willis, Thomas, physician (1621–73), studied at Christ Church, Oxford, was for a time Sedleian professor of Natural Philosophy, but became famous as a physician in Westminster. He wrote on the plague.

Willis's Rooms (closed 1890). See Almack's.

Will-o'-the-Wisp. See Ignis Fatuus.

Willoughby, Sir Hugh, explorer, probably a native of Risley in Derbyshire, of whom little is certain save his unfortunate fate. In 1553 an expedition was fitted out at an expense of £6000 by the merchants of London 'for the discovery of regions, dominions, islands, and places unknown,' and Willoughby was appointed its commander 'both by reason of his goodly personage (for he was of tall stature) and his singular skill in the services of war.' On the 10th of May he sailed from Deptford with three vessels, the *Bona Esperanza* of 120 tons, his own ship, carrying thirty-five persons; the *Edward Bonaventure*, 160 tons burden, commanded by Richard Chancellor, and carrying fifty men; and the *Bona Confidentia* of 90 tons, under command of Cornelius Durfoorth, with twenty-eight men. After sailing along the east coast of England and Scotland, they crossed the North Sea in company, and sighted the coast of Norway about the middle of July. In the middle of September the *Edward Bonaventure*, at Senjen during a storm, parted company with the two other vessels, which were tossed about until they reached the coast of Russian Lapland, where they found a good harbour at the mouth of the river Arzina, in which Sir Hugh determined to pass the winter. Here Willoughby and his sixty-two companions all perished during the course of the winter, doubtless of scurvy. The following year Russian fishermen found the ships with the dead bodies of the crews, together with the commander's journal and a will witnessed by Willoughby, showing that some of the mariners were alive in the January of 1554. Chancellor, after being separated from his comrades, sailed with the third vessel to Vardoehus, where he waited seven days for Willoughby, set out again, and finally reached the mouth of the river Dwina in the White Sea. Here he was well received by the natives, and the news of his arrival immediately despatched to the Tsar Ivan Vasilievich, who invited the mariners to the court of Moscow, where they spent a part of the winter, returning in the following summer to England. Willoughby's *Journal* was published in 1903.

Willow (*Salix*), a genus of trees and shrubs of the family Salicaceæ. This family, to which the Poplar (q.v.) also belongs, is distinguished by having the flowers naked; numerous ovules; a naked, leathery, one-celled, two-valved fruit; seeds with long hairs; leaves with stipules. In the willows the stamens are from one to five in number, the leaves simple and deciduous. There are many species and very numerous varieties and hybrids, so that identification is extremely difficult. They are mostly natives of the colder temperate regions of the northern hemisphere, although some are found in warm countries, as *Salix tetrasperma* in the hottest parts of India, and another species abundantly on the banks of the Senegal. Most of them are shrubs, and some are of very humble growth, particularly those of arctic and alpine regions. Thus, *S. herbacea*, which occurs on the mountains of Scotland, seldom rises more than an inch from the ground. *S. arctica* and *S. polaris* are the most northern woody plants. Other small species are also found to the very limits of perpetual snow in different countries, as *S. Lindleyana* on the Himalaya. Some of those which more generally receive the popular name willow are trees of large size and remarkably rapid growth. The

White Willow (*Salix alba*):
a, branchlet of male tree with flowers; *b*, do. female tree (Bentley and Trimen).

White Willow, or Huntingdon Willow, is by far the largest species known in Britain. It attains a height of 80 feet, and grows so rapidly that a cutting has been known to become a tree of 30 feet in ten years. Its head is much branched and spreading, its leaves narrow elliptical-lanceolate, silky beneath, and sometimes also above. The wood of some willows is used for many purposes, being remarkably tough and durable, although light and soft. It was anciently used for shields, and for building sloops of war. Cork-cutters and others employ it for whetting sharp-edged implements, and it is largely used in the manufacture of cricket-bats and for making paddles of steamboats. The leaves and young shoots are in some places used as fodder, and even dried and

stacked; and in times of scarcity the bark has been kiln-dried and ground, to mix with meal. Willows are often planted as ornamental trees, especially near streams and in moist grounds. Many kinds are also planted on the banks of rivers, to retain the soil in its place, and restrain the encroachments of the river. They are the better adapted for this purpose that they grow readily by cuttings; and willow-stakes driven into a moist soil strike root, and soon become luxuriant. The twigs of most of the willows are very tough and flexible, and are used by coopers for making hoops, and by gardeners for tying espalier trees, and for many similar purposes. They are much used for basket-making and other kinds of wickerwork (see OSIER); willow withes were probably amongst the first ropes used by man. But the young shoots of many of the kinds with ovate or little elongated leaves are comparatively brittle and ill adapted for wickerwork. Of this kind are the Sallows, trees or low shrubs with downy branches, generally ovate or obovate wrinkled leaves, having stipules. The Gray or Common Sallow (*S. cinerea*) makes good copsewood and excellent charcoal for gunpowder. Other common species are the Round-eared (*S. aurita*) and Great Round-eared (*S. caprea*) Sallows, the latter growing in a drier soil than the others, and becoming a small tree. The Long-leaved Sallow (*S. acuminata*) has lanceolate leaves. Willow-trees are sometimes treated as pollards, and the lop used for fuel and other purposes. They are also often grown as coppice-wood, yielding a great bulk of hoops, poles, fuel, &c. The Crack Willow (*S. fragilis*), the Goat Willow (*S. caprea*), and others with brittle stems and branches, which are unsuitable for basket-making, are often planted to furnish wood for charcoal for the manufacture of gunpowder, for which purpose it is greatly esteemed. A valuable medicinal principle called *Salicin* (q.v.) exists in the bark of willows. *S. pentandra*, a British species, besides being tonic is also possessed of aromatic properties. The flowers of the willow, which in many species appear before the leaves, are much sought after by bees. The male catkins (see figure at CATKIN) of many species are very beautiful, the prominent anthers being of a fine yellow colour, or, as in *S. purpurea*, of a rich purple. The sweet-scented male catkins of *S. ægyptiaca* are used in the preparation of a stimulant and carminative liquid much favoured in some parts of the East. The Weeping Willow (unfortunately named *S. babylonica*) is a very ornamental species, a native of China, now much planted in Britain and on the continent of Europe on account of its beautiful pendent twigs. Perhaps the most complete collection of willows in cultivation in Britain is that at Woburn, the seat of the the Duke of Bedford.

Common Sallow (*Salix cinerea*).

Willow Moth (*Caradrina quadripunctata*), a common British night moth, whose caterpillar, destructive to stored grain, pease, &c., is very frequent in ricks.

Willow-wren, or WILLOW-WARBLER, is not a wren but a Warbler (q.v.).

Wills, WILLIAM GORMAN, (1828–91), playwriter, was born in Kilkenny county, studied at Trinity College, Dublin, and was pupil in the art school of the Royal Irish Academy. He became known as a playwright when *The Man o' Airlie* appeared (1866), and followed this up by a series of plays, amongst which are *Charles I.* (1872), *Jane Shore* (1876), *Olivia* (1878), *Nell Gwynne* (1878), *Claudian* (1885), *Faust* (1891), *A Royal Divorce* (1891). He also painted portraits and wrote some novels.

Wills, WILLIAM JOHN (1834–61), explorer. See BURKE (R. O.), AUSTRALIA.

Willughby, FRANCIS, ornithologist, the son of Sir Francis Willughby, was born in 1635, and studied at Cambridge under Ray (q.v.). He spent some time at Oxford, and then started on the memorable continental tour (1663–66) with Ray. He died 3d July 1672 from the effects of over-study and hardship on a naturally weak frame. Ray edited and translated his *Ornithologia* (1676–78) and edited his *Historia Piscium* (1686). To the former Buffon and Linnæus were much indebted.

Wilmington, (1) the only large city and a port of Delaware, on the Delaware River and Brandywine and Christiania Creeks, 25 miles by rail SW. of Philadelphia. It is a handsome regular town, built on the slopes of a hill (250 feet), and contains the Old Swedes' Church (1698), the Old City Hall (1798), and other historic edifices, some imposing public buildings, various educational institutions, and a large number of public parks. Numerous manufactures include glazed kid, ships, railway cars, machinery, gunpowder and other explosives, cotton goods and other textiles, paints, paper, &c. A large river frontal makes coastwise and oversea commerce important. The Swedes first settled here in 1638, while 10 miles to the north the battle of Brandywine was fought between Howe and Washington in 1777. Pop. (1870) 30,841; (1900) 76,508; (1920) 110,168.—(2) A port of North Carolina, capital of New Hanover county, on the left bank of Cape Fear River, 30 miles from its mouth and about 145 miles SSE. of Raleigh. It has various public buildings, and manufactures cotton, rice, fertilisers; there are shipyards, foundries, sawmills, and the export trade is extensive. During the civil war it was one of the chief ports of the Confederacy, and was frequented by blockade-runners. Pop. (1870) 13,446; (1920) 33,372.

Wilmot. See ROCHESTER (EARL OF).

Wilmot Proviso, an amendment to a bill to appropriate $2,000,000 for the purchase of Mexican territory, moved in the United States congress in 1846 by Mr David Wilmot, to the effect 'that neither slavery nor involuntary servitude shall ever exist in any part of said territory.' The proviso passed the house, but was rejected by the senate, the Freesoil movement being the result (see FREESOILERS).

Wilna. See VILNA.

Wilson, ALEXANDER, American ornithologist, was born at Paisley, Scotland, July 6, 1766. He was the son of a weaver, and, though at first intended for the church, he was apprenticed in 1779 to the weaving-trade. Meanwhile he indulged his fondness for writing verses, for books and nature. He gratified a roving disposition by mounting a pedlar's pack for about three years, and published a volume of poems in 1790. The piece by which he is best remembered is a droll poem in the Scottish dialect, styled *Watty and Meg*, published as a

chap-book in 1792, and ascribed by some to Burns. He was prosecuted for a lampoon upon a master weaver during a trade dispute, and afterwards sailed from Belfast for America, and landed at Newcastle, Delaware, July 14, 1794, with a few borrowed shillings in his pocket, and no acquaintances. He got work with a copperplate-printer in Philadelphia, then with a weaver; travelled as a pedlar in New Jersey, where the brilliant plumage of the birds attracted his attention; was engaged as a school-teacher in Pennsylvania, and then walked 800 miles to visit a nephew in New York. Whilst he was teaching a school once more near Philadelphia, William Bartram, who was well acquainted with birds, stimulated and encouraged him in his studies of nature, and Alexander Lawson gave him lessons in drawing, colouring, and etching. His excellence at drawing birds strengthened his resolution to make a collection of all the birds that were to be found in America. In October 1804 he set out on his first excursion, in which he travelled to Niagara Falls, and wrote *The Foresters, a Poem*, and ere his return had walked 1260 miles. In 1806 he was employed on the American edition of *Rees's Cyclopædia*. He soon prevailed upon the publisher, Bradford, to undertake an American Ornithology, and in September 1808 he brought out the first volume, but in a style too costly for the tastes and fortunes of the period. The second volume was brought out in 1810. In 1811 he made a canoe voyage down the Ohio for 720 miles, and travelled overland through the Lower Mississippi Valley, from Nashville to New Orleans, collecting specimens for his third volume. His seventh volume appeared in 1813. In his eager pursuit of a rare species of bird, of which he had long wanted a specimen, he swam across a river, and caught a cold, which ended in his death, at Philadelphia, August 23, 1813, when he had nearly completed his work. The eighth and ninth volumes were published after his death, with memoir by Ord, his assistant. The work was continued by Charles Lucien Bonaparte, in 4 vols. (1828–33); and an edition by Sir W. Jardine (3 vols. 1832) has been more than once reprinted. Wilson was the first to study American birds in their native haunts, and his unrivalled descriptions are remarkable for fidelity and truth. A monument was erected to his memory in Paisley Abbey churchyard in 1874.

There are Lives by Crichton (1816), Ord (1828), Sir William Jardine (1829), Hetherington (1831), Jared Sparks (1851), Brightwell (1861), and A. P. Paton (1863), and a Sketch prefixed to Grosart's edition of his *Poems and Miscellaneous Prose* (2 vols. 1876).

Wilson, Andrew, a son of the Indian missionary, John Wilson (q.v.).

Wilson, Sir Daniel, LL.D., archæologist, was born in Edinburgh, the son of a wine-merchant, 5th January 1816. He was educated at the High School and university, and was early attracted to antiquarian studies. He had been for some time secretary to the Scottish Society of Antiquaries when in 1853 he was appointed professor of History and English Literature in the university of Toronto. He greatly promoted the prosperity of the university, and in 1881 became its president. In 1890 its valuable library was destroyed by fire, but in about a year he had collected a richer library than before. He was knighted in 1888; in 1891 received the freedom of Edinburgh; and died 8th August 1892. Amongst his works are *Memorials of Edinburgh in the Olden Time* (1847; new ed. 1892), which is a model local history; *Oliver Cromwell* (1843); *Archæology and Prehistoric Annals of Scotland* (1851; 2d ed. 1863), with about 200 illustrations drawn by himself; *Prehistoric Man* (2 vols. 1862; enlarged and rewritten 3d ed. 1876); *Chatterton* (1869); *Caliban: the Missing Link* (1873); poems entitled *Spring Wild Flowers* (1875); *Reminiscences of Old Edinburgh* (1878); *Anthropology* (1885); *William Nelson*, a Memoir (privately printed, 1890); *Left-handedness* (1891); *The Lost Atlantis* (posthumous, 1892). He edited for four years the Journal of the Canadian Institute, and was its president 1859–60.

Wilson, Sir Erasmus (1809–84), dermatologist, Egyptologist, and philanthropist, studied at Aberdeen and London, became known as a skilful operator and dissector at the College of Surgeons in London, but was best known as a specialist on skin diseases. He published an *Anatomist's Vademecum*, a student's *Book of Diseases of the Skin*, a *Report on Leprosy*, and, in a very different field, *Egypt of the Past*. The great wealth he acquired by his practice he bestowed largely in benefactions to the poor and to science, founding a chair of dermatology at the College of Surgeons and of pathology at Aberdeen, building new wings to hospitals, and promoting Egyptian research. He it was who brought, at a cost of £10,000, Cleopatra's Needle to England. He was F.R.S., LL.D., president of the College of Surgeons in 1881, and was knighted in the same year.

Wilson, Florence. See Volusenus.

Wilson, George, M.D., chemist, was born at Edinburgh, a younger brother of Sir Daniel Wilson, 21st February 1818. He attended the High School and university, was licensed as lecturer on chemistry in the Edinburgh College of Surgeons, afterwards became a popular lecturer on chemistry in the School of Arts and in the Veterinary College, and in 1855 was appointed professor of Technology in Edinburgh University. In conjunction with this office he was Regius Director of the Industrial Museum (now the Royal Scottish Museum), which owes much to his knowledge and skill. He died 22d November 1859. 'His great quality,' says Dr John Brown, 'lay in making men love ascertained and recorded truth, scientific truth especially; he made his reader and hearer *enjoy facts*. He illuminated the book of nature as the monks did the missals of old.'

Amongst his scientific works were *Text-book of Chemistry* (1850), in Chambers's Educational Course; *Researches in Colour-blindness* (1855); and *The Five Gateways of Knowledge* (1856), a delightful hymn or prose-poem of science. Other works were the *Life of Cavendish* (1851); the *Life of Dr John Reid* (1852); and (along with Geikie) the *Memoir of Edward Forbes* (1861). A volume of his letters on religious subjects, with preface by Dr Cairns, was published as *Counsels of an Invalid* (1862), and a volume of essays, *Religio Chemici* (1862). There is a *Memoir* by his sister (new ed. 1862).

Wilson, Henry, vice-president of the United States, was born the son of a farm-labourer at Farmington, New Hampshire, in 1812, and himself worked for eleven years on a farm. Born Jeremiah Jones Colbaith, he got rid of the name when he came of age, worked for a time as a shoemaker at Natick, Massachusetts, became prominent as an Abolitionist in the '30's, addressed sixty meetings for Harrison in 1840, and was elected to the Massachusetts legislature and state senate. He was an active leader of the Freesoilers (q.v.), assisted to form the new Republican party, and in 1855 entered the United States senate. There he sat for eighteen years, only leaving its floor to assume its presidency as vice-president of the United States in 1873. During the civil war he had been chairman of the important committee on military affairs, and had rendered great services in the matter of organising the army and raising and equipping

troops. But in 1873 he had a stroke of paralysis, and died on 22d November of that year. Of his many writings, the chief is his *History of the Rise and Fall of the Slave Power in America*, completed by another hand (3 vols. 1872–75). See the Life by T. Russell and the Rev. E. Nason (1872).

Wilson, Sir Henry Hughes (1864–1922), field-marshal (1919), was born at Edgeworthstown, Ireland, served in Burma, S. Africa, &c. In the Great War he started (1914) as Director of Military Operations, and ended (1918) as Chief of the Imperial General Staff, and he took a prominent part in the negotiations at Versailles (1919). He was assassinated by two Irishmen in London for having assisted the Government of Northern Ireland. See Life by Callwell (1927).

Wilson, Horace Hayman, Sanskrit scholar, was born in London, 26th September 1786. He studied medicine, and in 1808 went to India as assistant-surgeon on the Bengal establishment of the East India Company. His knowledge of chemistry led to his being employed in the Calcutta mint as assistant to Leyden; his mastery of Sanskrit, to his appointment, on the recommendation of Colebrooke, as secretary of the Asiatic Society of Bengal. In 1833 he became Boden professor of Sanskrit in Oxford, and soon after was appointed librarian at the East India House. These appointments he held till his death, 8th May 1860.

His first work was a verse translation of Kâlidâsa's *Meghadûta*, or *Cloud Messenger* (1813). Next followed a Sanskrit-English dictionary (1819); *Specimens of the Theatre of the Hindus* (3 vols. 1827); translations of the *Raghu Vanśa* (1832); the *Vishn'u-Purân'a* (1840); *Sanskrit Grammar* (1841); *Ariana Antiqua, the Antiquities and Coins of Afghanistan* (1841); *History of British India from 1805 to 1835* (1848); *Rig-Veda-Sanhitâ* (1850); and *Glossary of Judicial and Revenue Terms, from the Arabic, Persian, Hindustani, &c.* (1855). His collected works have been edited by R. Rost and F. Hall (13 vols. 1861–67).

Wilson, James (1742–98), American jurist, was born near St Andrews, Scotland, educated at the university there, and emigrated to America in 1765. He represented Philadelphia at various congresses, was advocate-general for the French Government (1779–83), took a prominent part in the signing of the Declaration of Independence (1787), and in 1790 was appointed professor of law at Philadelphia College. His *Works* were edited by his son (1803–4), and by J. D. Andrews (1896).

Wilson, James, economist (1805–60), was born at Hawick, settled in business in London, and became known as an author of books on the Corn Laws and the currency. He founded the *Economist* newspaper, entered parliament as a Liberal in 1847, and held successively the offices of Financial Secretary to the Treasury, Vice-president of the Board of Trade, and member of the Council of India.

Wilson, John, 'Christopher North,' was born at Paisley on 18th May 1785. He was the eldest son, but fourth child, in a family of ten—his father a rich self-made manufacturer of gauze, his mother, Margaret Sym (1753–1825), a descendant of the great Marquis of Montrose. His earlier education he received at the manse of Mearns, a wild moorland parish of Renfrewshire, till in 1797, shortly after the death of his father, who left him a fortune of £50,000, he was sent to the university of Glasgow. Here he carried off many prizes, wrote essays and verses, and fell in love with one 'Margaret.' In 1803 he went up to Magdalen College, Oxford, as a gentleman-commoner, and soon became notable alike for the splendour of his intellectual gifts and for his supremacy in the various athletic sports—boxing, rowing, running, riding, swimming, &c. A six-foot Apollo, he leapt the Cherwell (23 feet wide), and walked back from London in a single night; withal he was a patron of the cockpit and a winner of the Newdigate (1806) by his prize poem on 'The Study of Greek and Roman Architecture.' Having taken a—'glorious' B.A., and broken off his 'unfortunate attachment,' in 1807 he settled in Westmorland, attracted partly by the beauty of the Lake Country and partly by a desire to cultivate the intimacy of Wordsworth, of whose genius he was already a devout admirer. He purchased the charming little property of Elleray, overlooking Windermere; associated not only with Wordsworth, but with Southey, Coleridge, De Quincey, and the rest; kept a whole fleet of boats on the lake; and would match himself sometimes against the Cumberland wrestlers, one of whom has left it on record that he was 'a vera bad un to lick.'

In May 1811 he married Miss Jane Penny, a Liverpool lady, and now seriously devoted himself to poetry, in 1812 publishing his *Isle of Palms* (written five years earlier), and in 1816 *The City of the Plague*. Both had a fair success; but in 1815 the loss of his whole patrimony through an uncle's unjust stewardship obliged him to give up Elleray and settle with his mother in Edinburgh. He was called to the Scottish bar, but 'knew not what the devil to do' with the few briefs that came to him, so on the starting in 1817 of *Blackwood's Magazine* he proffered his services. They were readily accepted; and it is not too much to say that Wilson and his friend Lockhart (q.v.) were during its earlier years the soul of 'Maga's' success. Lockhart was withdrawn in 1826 to London; and Wilson, though never strictly its editor, became in the eye of the public more and more identified with the magazine; in a certain modified, yet very real sense, for many years he *was* editor. Meanwhile in 1819 he found himself in a position once more to set up house for himself, and in 1820 was elected over Sir William Hamilton to the Edinburgh chair of Moral Philosophy. The contest turned upon politics, and he as a Tory found favour with the town-council; still, though to begin with he knew little or nothing of his subject, and though even as a professor he would sometimes indulge in a 'mill,' he played a more than creditable part, and showed a wonderful power of stimulating the enthusiasm of his students. In 1837 he suffered an irreparable loss in the death of his wife; in 1840 he had a first slight shock of paralysis. He received a pension of £300 a year in 1851, and died on the midnight of 2–3d April 1854 at 8 Gloucester Place, Edinburgh, his home since 1826. He was buried in the Dean Cemetery, and in 1865 a statue of him by Sir John Steell was erected in Princes Street.

Wilson's works, collected and edited by his son-in-law, Professor Ferrier (12 vols. 1855–58), include *Lights and Shadows of Scottish Life* (1822), *The Trials of Margaret Lyndsay* (1823), and *The Foresters* (1825), as well as thirty-nine out of seventy of the 'Noctes Ambrosianæ,' which appeared in *Blackwood's* during 1822–35, and are dialogues named after 'Ambrose's Tavern,' the interlocutors comprising 'Christopher North,' 'Tickler' (his uncle, Robert Sym, 1750–1844), and the 'Shepherd' (Hogg). They in their day and in Scotland enjoyed an amazing vogue, and they are still remembered if not much read, while his poems and tales are well-nigh forgotten. Remembered and yet unread, in spite or because of *The Comedy of the Noctes, selected by John Skelton* (1876), where, if the selections had been the omissions, the result might have been more tolerable. A fine manly, healthy character, a true lover of Nature and Sport, and a first-rate exponent of both, Wilson was all this and something more; but he was not a humorist, though he was always trying to be humorous. Guffaws,

not laughter, run through all his writings, which Hallam likened to 'the rush of many waters.'

See the Memoir by his daughter, Mrs Gordon (1862); an article by Watts-Dunton in the *Athenæum* (8th July 1876); Professor Saintsbury's *Essays in English Literature* (1891); Mrs Oliphant's *William Blackwood and his Sons* (1897); and Sir G. Douglas's *Blackwood Group* (1897).

Wilson, JOHN, Indian missionary, was born a farmer's son near Lauder, in Berwickshire, 11th December 1804. Educated at Edinburgh University, he went in 1828 to Bombay as a missionary; and there he laboured—from 1843 under the flag of the Free Church of Scotland—till his death, 1st December 1875. His mastery of the languages of Western India, and grasp of the literature, the history, the faiths, and the social usages of the races of India, combined with his energy, sagacity, and broad sympathy to give Wilson an unexampled influence. An active promoter of education, legal reform, toleration, and philanthropic movements of every kind, he was much consulted by government, especially during the crisis of 1857. He was twice president of the Bombay branch of the Asiatic Society, and was vice-chancellor of the Bombay University, F.R.S., and Moderator in the Free Church Assembly in 1870. His chief writings were *The Parsi Religion* (1843) and the *Lands of the Bible* (1847). See the Life by Dr George Smith (1878).

His son, ANDREW (1830–81), was born at Bombay, and studied at Edinburgh and Tübingen. He was for three years editor of the *China Mail*, and later of the *Bombay Gazette*, wrote much for *Blackwood* and other serials, but is best known for his account of Gordon's *Ever Victorious Army* (1868) and his book on the Himalayas, *The Abode of Snow* (1875). He also wrote a *Schiller* for the 'Foreign Classics' series.

Wilson, JOHN MACKAY, the originator of the *Tales of the Borders*, was born at Tweedmouth in 1804, failed to make his bread in London, and after writing dramas and poems, and lecturing with much applause but little profit, became in 1832 editor of the *Berwick Advertiser*. But in his days of hardship he had formed habits of intemperance, and after a short illness he died at Berwick-on-Tweed, 2d October 1835. His *Tales* long had a vogue in Scotland not exactly proportional to their deserts. They were originally issued from Berwick in weekly numbers, beginning 8th November 1834, and in six months had reached a circulation of 30,000. Wilson worked unaided till the end, but thereafter the *Tales* were continued for his widow's behalf by Sutherland, an Edinburgh bookseller, who employed Alexander Leighton (1800–74) as editor. Among the writers were Leighton, Sir Theodore Martin, Hugh Miller, 'Delta,' Professor Thomas Gillespie, and James Maidment.

The *Tales of the Borders* were first collected in six quarto volumes (1835–40). A new edition, revised by Leighton, extended to 20 vols. (Manchester, 1857–59); his 1869 revision contained four volumes more.

Wilson, RICHARD, landscape-painter, was born at Penegoes rectory, Montgomeryshire, 1st August 1714. After studying under a London portrait-painter (1729–35), he took to portrait-painting on his own account, but during a six years' visit to Italy (1749–56) was advised to forsake portrait for landscape. To landscape-painting he now exclusively devoted himself; and before returning to England he had succeeded at Rome in establishing a considerable reputation. In London in 1760 he exhibited his great picture, the 'Niobe,' and at once secured rank as one of the first painters of his time. Another celebrated work was his 'View of Rome from the Villa Madama.' Failing, however, to hit the general taste, he fell into the hands of the picture-dealers; and so straitened did he frequently find himself that in 1776 he was glad to obtain the appointment of Librarian of the Royal Academy. By the death of a brother he came into a small estate at Llanferras in Denbighshire, and retiring there died some few years after in 1782. Of his numerous pictures, now much prized, many were engraved by Woollett and others; the National Gallery contains nine specimens of his work.

Wilson, GENERAL SIR ROBERT THOMAS, was born in London in 1777, had his education at Westminster and Winchester, and when scarcely seventeen joined the 15th Light Dragoons, and saw some sharp service in Belgium. In 1798 he was engaged in Ireland in the suppression of the rebellion, next served in the unfortunate campaign of the Helder, commanded Sir Ralph Abercromby's cavalry in Egypt, took part in the conquest of the Cape of Good Hope in 1806, and next went abroad on the staff of Lord Hutchinson, who was sent on a mission to the king of Prussia, then a fugitive from his capital. He witnessed the desperate battle of Eylau, and on the peace of Tilsit returned to England. He was next sent to the Peninsula, helped to train the Portuguese army, and under Wellington commanded a Spanish brigade at Talavera. In 1812 he was attached to the Russian army as English military commissioner, and during the struggle which resulted in the capture of Moscow, and the pursuit of the doomed French army, he rendered important service both in council and in the battlefield. Throughout subsequent campaigns in Germany and in France he was present in a similar capacity in the camp of the allies, and at Lützen he took command of the Prussian reserve. After the peace he became involved in the unfortunate matter of Queen Caroline, and was dismissed the army, but afterwards reinstated. In 1841 he attained the rank of general; from 1842 to 1849 held the post of governor of Gibraltar; and from 1818 to 1831 sat in the Liberal interest for Southwark. He died suddenly in London, 9th May 1849.

He wrote a *History of the British Expedition to Egypt*—the source of the horrible charge that Napoleon poisoned his sick at Jaffa; *Inquiry into the Present State of the Military Force of the British Empire* (1804); *Campaigns in Poland, with Remarks on the Russian Army* (1810); and *Sketch of the Military Power of Russia* (1817). His *Private Diary* during his foreign campaigns was edited by his nephew and son-in-law, the Rev. Herbert Randolph (2 vols. 1861), who also prepared a Life (2 vols. 1863).

Wilson, THOMAS, English divine and saint, was born at Burton in Cheshire, September 20, 1663, made his studies at Trinity College, Dublin, and served as curate of Newchurch Kenyon from 1686 till 1692, when he became chaplain to the Earl of Derby, who appointed him Bishop of Sodor and Man in 1697. He died 7th March 1755. His *Principles and Duties of Christianity* (1707), commonly called the Manx Catechism—the first book printed in the native tongue—and his *Essay towards an Instruction for the Indians*, written for Oglethorpe's Georgia plantation scheme, were combined to form *The Knowledge and Practice of Christianity made easy to the Meanest Capacities* (1755). But his name best survives in his admirable *Short and Plain Instructions for the Better Understanding of the Lord's Supper* (1736), and *Sacra privata, Private Meditations, Devotions, and Prayers* (1800). He instituted a Manx translation of the Bible. The standard edition of his works is that by Keble (7 vols. 1847–52), with prolix Life.

Wilson, THOMAS WOODROW, twenty-eighth president of the United States, was born 28th December 1856, at Staunton, Virginia, the son of a Presbyterian minister of Scottish-Irish descent.

His mother, Janet Woodrow, was the daughter of a Scottish minister, who emigrated from Carlisle to Ohio in 1837. His Celtic descent and a rigorously Calvinistic upbringing are circumstances to which much of Wilson's later life must be referred back. A child of no great robustness he spent a more or less quiet boyhood, moving with his parents first to Augusta (Ga.), then to Columbia (S.C.) and Wilmington (N.C.), and eventually entered Princeton College at the age of eighteen. There he became notable as a debater, and was a keen enough student of matters which interested him, displaying considerable literary ability in writing on such subjects as the study of government and politics. He graduated in due course—with no great distinction, however—and proceeded to the university of Virginia, where he studied law. For a time he attempted to carry on a practice in Atlanta, but he preferred to continue his studies, and in 1883 took a doctor's degree at John Hopkins University, his thesis on 'Congressional Government' being regarded an important contribution to the subject. In 1885 he obtained a professional appointment at Bryn Mawr Ladies' College, but left it for what was to him the more congenial atmosphere of Wesleyan College, Connecticut. In 1890 he returned as a professor to Princeton, where he taught jurisprudence, political economy, and, later, politics. He became president of the university in 1902. His literary output during his teaching career was considerable, though his works, like his lectures, proceeded rather from a good analytic mind than from an original thinker. The most important books of this period were *The State* (1889; new ed. 1911), *Division and Reunion* (1893), *A History of the American People* (1902; new. ed. 1912), *Constitutional Government* (1908). But his elevation to the presidency gave him an opportunity to be more than a mere writer. He saw Princeton falling, like other universities, a prey to materialism and moneyed interests, and determined to save it, and, as he put it, to create 'an enthusiasm for learning in Princeton.' He attacked the prevailing snobbery, and introduced the preceptorial system, and might have done more but for bitter opposition, which at times taxed his physical endurance severely. A protracted quarrel over the proposed establishment of a graduate school finally became unbearable, and Wilson, who was already before the eye of at least a section of the public, left his academic career for that of politics, being elected governor of New Jersey in 1910.

Into his new sphere Wilson brought the same spirit of antagonism to everything undemocratic. The cornering of politics by party 'bosses' and the tyranny of large financial interests were struck at by a series of reforming acts, which brought him in some degree to public notice. In 1912 he was nominated as Democratic candidate for the presidency of the republic, and with the Republicans divided between the 'conservatives' of Taft and the 'progressives' of Roosevelt, his election was fairly certain. He had not, however, a clear majority over his two opponents, but could rely on his abilities to gain popular favour, especially as his programme was not very far removed from that of the Rooseveltian party, for the liberalising movement in America was in full swing. He did not disappoint his supporters in regard to domestic reform, for to his first term belong such important measures as the Underwood Tariff Act (a drastic downward revision of the tariff), the Federal Reserve Act, the Federal Trade Commission Act, and Clayton Anti-trust Act. The success of this part of his programme was not overlooked when the 1916 election came round. But before then there were other more serious issues in the field of foreign affairs, especially in Mexico and Europe (see UNITED STATES, *History*). Wilson's policy in Mexico was not always clear, and afforded an apt basis for criticism, but it was swamped by the greater questions arising from the World War (q.v.).

The neutrality to which Wilson adjured the people of the United States at the beginning of the war in Europe was soon seen to be a difficult proposition. Yet in spite of the growing sentiment of partisanship, Wilson, to the outer world at least, remained unbiassed. His idealism, which he brought with him into politics, his conviction that right must prevail over might, could make him think of a successful mediation by America, of a peace without victory unless it were a lasting victory over war. Yet the naval policies of both camps of belligerents became a vital concern to American shipping, and Wilson protested vigorously in a series of notes conspicuous for their patience. But Germany steadily exasperated America, and the latter's policy of neutrality became one of 'preparedness.' In 1916 Wilson carried the presidential election with a small majority over the Republican Hughes, his supporters urging that 'he kept us out of war.' In the winter of 1916–17 he made an attempt to open peace proceedings, but was answered by a ruthless German submarine campaign, and America's policy of 'preparedness' gave way to war. 'The world,' Wilson said in his address to Congress, 2d April 1917, 'must be made safe for democracy. . . . We have no selfish ends to serve. We desire no conquest. . . . We are but one of the champions of the rights of mankind.' In the war period Wilson advanced himself practically to a dictatorship, turning his energies to every branch of service, and leading his people in the path that he deemed best. But his idealism remained. His chief contribution to the peace overtures of the winter of 1917–18 was a manifesto, the outcome of much private investigation, which he delivered in a speech to Congress in January 1918, and which retained its fame as the 'Fourteen Points.' It aimed at a just and permanent peace free from diplomatic intrigue and international jealousies. Succinctly stated, it stipulated for: (1) Open covenants—publicity of diplomacy; (2) absolute freedom of navigation upon the seas outside territorial waters; (3) removal of economic barriers; (4) a guarantee for the limitation of armaments; (5) an open-minded adjustment of all colonial claims. Clauses 6 to 13 were concerned with the restitution of occupied territory in Russia, Belgium, France, Rumania, Serbia, &c., the settlement of frontiers along lines of nationality, and opportunities for autonomous development in the countries of eastern Europe, provision being made for an independent Polish state. The final clause said that 'a general association of nations must be formed under specific covenants for the purpose of affording mutual guarantees of political independence and territorial integrity to great and small states alike.' In supplementing these points at a later date Wilson spoke of a supreme international authority, a League of Nations, to work for harmony between the nations. 'What we seek,' he said on 4th July 1918, 'is the reign of law based upon the consent of the governed, and sustained by the organised opinion of mankind.' The propounder of these ideas became not unnaturally a prominent figure in the eyes of the peoples of Europe. Both sides examined them carefully, and they formed, with modifications, the basis of the armistice of 11th November 1918.

From this point Wilson revealed one by one the limitations of his genius. A serious blunder was his partisan appeal for a Democratic Congress in the elections of 1918, when he should have submerged party issues; it turned feeling against him, and

gave him a Republican Congress. Then, fearing for the success of his peace schemes at a European council-board, he determined, even though the constitution obliged him to share his treaty-making power with the senate, to overrule precedent and go in person to Europe. The peace commission which he took with him included nobody likely to check his action. He landed at Brest in December 1918, and was accorded a magnificent welcome in the capitals of Europe which he visited. At the peace conference in Paris his influence was —for a time, at least—dominant. He succeeded in establishing the principle of the covenant of the League of Nations as stated in its preliminary draft, and stoutly held that it must be an integral part of the Treaty of Versailles (q.v.). Visiting America for a brief space, he returned to Paris with the covenant and some amendments, but he began to lose prestige among the nations represented at the conference when they saw his principles run counter to their several national aspirations. He had to concede many points, hoping for a later settlement, and in July 1919 returned to America with the final draft of the treaty and covenant. But the opposition in his own country proved more implacable than that in Europe. The senate would accept the covenant with reservations, Article X. being the chief stumbling-block, but Wilson hardened into obstinacy. He refused to compromise, and the resolution for ratification was ultimately defeated. Meanwhile a physical collapse, which had threatened in Paris, overtook him while he was on a canvassing tour in Kansas. The world saw little of him after that. His principles, left without a champion, were defeated in the elections of 1920, which gave the United States once more a Republican president. Stricken by paralysis, he died in his sleep at Washington on 3d February 1924.

Whatever be the judgment of posterity on his accomplishments, Wilson's dramatic political career must remain one of the great tragedies of modern history. A devout son of the manse, beginning life with a set purpose, schooled to the last degree in the academic side of politics, he seemed an apt crusader for the cause of universal brotherhood. Yet his training in practical politics was short, and he failed, or refused, to see his weaknesses. Hence, perhaps, the maze of paradoxes that rendered his character a puzzle. A champion of constitutional government, he was nevertheless at times nothing short of an autocrat, pushing to its extreme his contention that the president is leader of the nation. Unafraid to attack, he was afraid to compromise in his hour of greatest need; unafraid to take counsel in smaller matters, he was afraid to trust any but himself in questions of principle; at one time a model of patience and long-suffering, at another a model of impulsiveness; as a man genial and capable of the sincerest friendships, yet unscrupulous in turning his back upon his closest associate; a friend of mankind, yet a solitary figure. One set of qualities brought him to the presidency; the other set overthrew him.

Wilson was twice married—the first time in 1885 to Ellen Louise Axsen, who died in 1914; the second time in 1915 to Mrs Edith Bolling Galt of Washington. His later writings include *The New Freedom* (1913), *International Ideals* (1919).

The chief monographs on Wilson are those by Ford (1916), Dodd (1920), Seymour (1920), Tumulty (1922), Baker (1923), Lawrence (1924), and White (1926). His *Public Papers* were edited by Baker and Dodd in 1925.

Wilton, a market-town of Wiltshire, at the confluence of the Nadder and Wyly, feeders of the Avon, 3¼ miles WNW. of Salisbury. The ancient capital of Wessex, it gave name to the county, and was the scene of Alfred's first battle as king with the Danes (871), and the seat of a bishopric (909–1050), but after 1244, when it had twelve churches, declined through the diversion of the great western road. The present church, erected in 1844 by Lord Herbert of Lea at a cost of £20,000, is an ornate Lombardic structure, with a wealth of marbles, mosaics, and stained glass, and a campanile 108 feet high. On the site of a Saxon nunnery is Wilton House, the seat of the Herberts (q.v.), where Sidney wrote part of the *Arcadia*. It is famous for its Van Dycks and other art-treasures, and for the beauty of its grounds. Since Elizabeth's reign Carpets (q.v.) have been manufactured at Wilton, which is a municipal borough, first chartered by Henry I., and reformed in 1885. It returned two members till 1832, and then one till 1885. Pop. 2000.

See the *Registrum Wiltunense* (Lond. fol. 1827), and James Smith's *Wilton and its Associations* (Sal. 1851).

Wiltshire is an inland English county, bounded on the N. by Gloucestershire and Berkshire, on the E. by Berks and Hampshire, on the S. by Hants and Dorsetshire, and on the W. by Somersetshire and Gloucester. Its greatest length, north to south, is 54 miles; its greatest breadth, east to west, is 37; and the area is 1350 sq. m. or 864,101 acres. Pop. (1801) 183,820; (1841) 256,280; (1881) 258,970; (1921) 292,213. This unusually small proportion of inhabitants is due to the presence of extensive tracts of open pasture-land in the centre and north of the county—Salisbury Plain and the Marlborough Downs. The river systems of the county divide near Devizes, whence the Lower or Somersetshire Avon, entering Wilts from Gloucester, flows to the Severn below Bristol; the Southern or Hampshire Avon flows by Salisbury to the English Channel at Christchurch; and the Kennet flows to join the Thames at Reading, thence to the German Ocean. The chief Wiltshire feeders of the Lower Avon are the Newnton, Merden, Broughton, and Whaddon; and of the Southern Avon, the Wyly (joined by the Nadder at Wilton) and the Bourne. By far the larger portion of the county is occupied by Chalk. This forms in the main a great upland separated by a broad hollow of Greensand, ranging by Devizes to Burbage, into the Marlborough Downs and Salisbury Plain, and rising on the Berkshire border into the highest point of the English Chalk, Inkpen or Hackpen Beacon (972 feet). Greensand also borders the Chalk north and west, and is succeeded by a band of Oolite exposing the Purbeck and Portland beds, the Kimmeridge Clay, Coral Rag, and Oxford Clay —the latter ranging from Frome, by Bradford, Chippenham, and Malmesbury. London and Plastic Clay and Bagshot Sands extend somewhat into the county from Berks and Hants; and there are Quaternary gravels near Salisbury and Melksham. The Wiltshire Oolites are in parts highly fossiliferous, and at points yield valuable building-stone—as at Fonthill, Tisbury, Chilmark, Swindon, Corsham, and Box. Iron ore was worked and smelted in the county in remote antiquity, but of late only in the vicinity of Seend, and since of Westbury, the upper beds of the Coral Rag there consisting of oolitic grains of hydrous oxide of iron cemented by calcareous matter. The railways are connected with the Great Western and the Southern systems, and the former company has extensive works at Swindon (q.v.). The industries are chiefly agricultural—dairy-farming predominating in the north, and grazing in the south. Large flocks of sheep feed on Salisbury Plain. There are extensive factories at Calne, which send out the Wiltshire bacon. There is also an important manufacturing element—Bradford

and Trowbridge still maintain the old reputation of the West of England for the highest quality broadcloths; and the Wilton carpets are made at the town of that name. Marlborough is the seat of a great public school. The flora is noteworthy, and includes a number of rare plants. Though the rolling open country is as a rule monotonous and tame, there is much charming scenery in the valleys and amongst the broken hill districts, especially of its western borders; while there are fine stretches of woodland connected with its numerous seats—especially at Savernake, Bowood, Longleat, Wardour, and Wilton. Savernake Forest and Cranbourne Chace, indeed, have undergone little change for centuries. Wiltshire was well settled by the Romans, and played a prominent part in early Saxon days; and the defeat of the British by Cynric at Old Sarum in 552 was the first important Saxon success. Four years later the victory of Cynric and Ceawlin at Barbury included the shire in the West Saxon kingdom, of which Wilton eventually became the capital. At Wilton Alfred suffered his first defeat from the Danes; and Edington, near Westbury, is suggested as the Ethandune where he defeated Guthrum. Wilton was the scene of another battle of note in the wars of Stephen and Matilda, when the presence of numerous castles and garrisons brought great suffering on the inhabitants of the district generally. The early importance of Wilton —itself named from the river Wyly—caused it to give name to the county as Wiltonscire. Waller's defeat at Roundway Hill, Devizes, and the gallant defence of Wardour Castle by Lady Arundell were the chief local episodes of the Great Rebellion. The civil record of Wilts is peculiar. Before 1832 it sent thirty-four members to parliament, including two from Old Sarum, which had neither house nor inhabitant. Old Sarum, Downton, Great Bedwyn, Heytesbury, Hindon, Ludgershall, and Wootton Bassett were then swept away, Calne, Malmesbury, Wilton, and Westbury reduced to one each, and the total made eighteen. From 1867 to 1885 the number was fifteen, to 1918 six—five for county divisions and one for Salisbury—thereafter five, for county divisions only. The municipalities are Calne, Chippenham, Devizes, Malmesbury, Marlborough, Salisbury, Swindon, and Wilton.

From the standpoint of the archæologist Wilts is the premier county in England. Stonehenge has been famed for ages throughout the civilised world. Still more remarkable are the less-known, much-ruined megalithic circles and avenues of Avebury—'as much excelling Stonehenge as a cathedral doth a parish church'—while Silbury Hill, near by, is the largest tumulus in Europe. Barrows of various kinds so abound that it was in Wiltshire barrow-digging first became a science. Relics of palæolithic man are yielded by the river gravels near Salisbury and elsewhere; and thence downward human representation may be regarded as complete. Earthworks, like barrows, are exceptionally numerous. The Wansdyke stretches across the north of the county for miles, traversing the Marlborough Downs. Grimsditch intersects the south of the county near Downton. The huge ramparts of Old Sarum are unique in their record of successive occupation on English soil—in turn the stronghold of Celt, Roman, Saxon, Norman, and seat of the see until Salisbury was founded in the lowlands by the river. Bradford-on-Avon contains the most perfect Anglo-Saxon church in existence. Salisbury Cathedral is the noblest illustration of the Early English style. The Norman castle of Devizes was unmatched in England, but neither of that nor of its sister fortalices are there many traces left. There is magnificent Norman work in the remains of Malmesbury Abbey. Domestic buildings of the 14th and 15th centuries are numerous and good. Longleat has been regarded as the finest Elizabethan mansion in the kingdom. Among modern structures the most remarkable is the Lombardic church at Wilton built by the first Lord Herbert of Lea.

See the articles AVEBURY, SALISBURY, STONEHENGE, WHITE HORSE, &c.; works by John Aubrey (ed. by Rev. J. E. Jackson, Devizes, 1862), Sir R. C. Hoare (8 vols. 1812-44), John Britton (3 vols. 1801-25), H. Moody (Winchester, 1851), J. E. Jackson (2 vols. 1867-72), W. H. Jones (3 vols. 1865-80), E. Kite (Devizes, 1880), Stratford (1882), R. Jefferies (*Life in a Southern County*, 1882), A. C. Smith (1884-85), and R. N. Worth (1887), besides the *Wilts Archæological and Natural History Magazine* (since 1853).

Wimbledon, a south-western residential suburb of London, a municipal (1905) and parliamentary (1918) borough in Surrey. Wimbledon is now the headquarters of English tennis. Pop. (1921) 61,451. —WIMBLEDON COMMON is an open, breezy heath of 628 acres, 7 miles SW. of London. Here from 1860 till 1889 in July was held the annual meeting of the National Rifle Association, since transferred to Bisley, near Woking. Linnæus here first saw the gorse in bloom; and here many duels were fought.

Wimborne Minster, an urban district of Dorsetshire, at the confluence of the Allen and Stour, 6 miles N. of Poole and 22½ E. of Dorchester. Here, about 705, St Cuthburh, King Ine's sister, founded a nunnery, which Edward the Confessor refounded as a collegiate church—the noble cruciform minster, Norman to Perpendicular in style, with a central and a west tower, and the tomb of Ethelred I. There is also a grammar-school (1496; refounded 1563). The engineering works are important. Pop. (1921) 3742.

Winchelsea, a decayed Cinque Port of Sussex, affiliated to Hastings, is 2 miles SW. of Rye by rail, and from 1832 to 1885 was included in the parliamentary borough of Rye. The present ancient city, which has a population of about 700, is New Winchelsea. Old Winchelsea, often named in the history of the 11th, 12th, and 13th centuries, stood 3 miles SE., but was often inundated by the sea, and finally submerged and destroyed in 1287. New Winchelsea was built on a remarkably regular quadrangular plan under the immediate auspices of Edward I. Of the old church of St Thomas, which dates from 1300, the chancel with aisles and part of a transept remains, containing some fine canopied tombs. Parts of a Franciscan monastery are to be seen; and three of the gateways of the fortified city remain. The town gives an earl's title (in the form Winchilsea, q.v.) to the family of Finch-Hatton, a title now conjoined with that of Earl of Nottingham. See CINQUE PORTS.

Winchester, the city of Hampshire, is situated on the Itchen, 60 miles WSW. of London. It originated, as some other towns, in a tribal settlement placed for safety on the summit of a hill. As the settlers became more numerous they descended the slope (St Catherine's) to the more convenient plain; and here arose *Wenta* (later *Caer Gwent*) to be known to the Romans as *Venta Belgarum*, and to the Saxons as *Wintanceastre*. The Romans, on coming up the river, observed the advantages of the site, took possession of the town, and formed its future plan. They made it rectangular, the main streets crossing at right angles, and the principal one corresponding with the present High Street. Alongside of the wattled huts of the 'Belgæ' soon grew up city walls, temples (to Apollo and Concord), and other evidences of southern civilisation. A head college for flamens was established, and, if the record be true, the first Christian church in Britain was

built here, 169 A.D. Tesselated pavements and many relics of this period are preserved in the city museum and deanery porch, while the walls of Wolvesey are studded with Roman bricks and drums of columns. The church was converted into a 'temple of Dagon' (Woden?) by the Saxons, 495 A.D.

The palmy days of Winchester, when it disputed with London the claim to be the capital of England, were during the last three Saxon and first two Norman centuries. Early in the 7th century an Italian monk, Birinus, converted King Cynegils, whose son gave all the land as far as 7 miles round Winchester—some of it is still held by the dean and chapter—for the establishment of a new church. Moreover, the palatial fortress of Wolvesey was the royal residence of the kings of Wessex, which became England. Alfred the Great, educated here at the Prior's School, resided during his long reign at Winchester, of which his tutor St Swithun (see SWITHIN) was a native and afterwards a bishop. At Wolvesey his scribes compiled the 'Anglo-Saxon Chronicle,' the first English prose book, assisted by the king himself, who ordered that the volume should be kept there; it is now in Corpus Christi College, Cambridge. His queen founded St Mary's nunnery here—the site now marked by Abbey House—in which her daughter in pious humility washed the nuns' clothes. Alfred also founded the 'New Monastery,' afterwards called from his favourite master, 'St Grimbalds.' After the king's death the monks by trickery obtained his body, which had been buried in the adjacent monastery of St Swithun's, and, becoming also possessed of the bones of St Josse, caused a rich stream of miracles to flow forth. Cnut presented them with a great cross, containing sixty pounds of silver and fifteen of gold. But in Edgar's reign a cathedral had arisen which far surpassed this or any other ecclesiastical edifice in England. Bishop Æthelwold, with Dunstan, introduced the stricter monasticism, but was not above using a 'vocal cross' and disregarding the rights of property. He erected a magnificent building, which had numerous altars, a tremendous organ, a lofty tower with golden gargoyles and balls like stars, a marvellous weathercock, and a crypt which became the burial-place of kings and bishops. But chief attraction here was the body of St Swithun and the miracles it produced.

The abbot of the 'New Monastery,' being Harold's uncle, went in arms with some of the monks to the battle of Hastings. William was greatly displeased, and when he built his palace at Winchester, which extended from the present Butter Cross to Minster Street and Lane, the monks were so much circumscribed that they were glad to move across to Hyde Mead, on the north-west of the city. This took place in 1110, and thirty years afterwards the abbey was destroyed by fire-balls from Wolvesey. Bishop de Blois, who had rebuilt that castle and filled it with art-treasures—some ruins remain—sided with his brother Stephen in his conflict with Matilda in 1141, when the south of Winchester supported the king and the north the empress. The fight raged for seven weeks in the heart of the city. The monastery was soon afterwards rebuilt; in 1390 the abbot was mitred, and at the dissolution the silver was calculated to be worth 2000 marks. In 1788 a bridewell was constructed out of the ruins, but portions of St Bartholomew's Church appear to be old. Beneath the east window lie the bones of five persons found here in 1867, and supposed to be those of King Alfred, his queen, two sons, and St Grimbald.

The castle of Winchester is said to have been built by order of the Conqueror, and certainly was in existence in the reign of Henry I. The Norman castle consisted of a tower 52 feet square, and had walls 14 feet thick. Here was kept for some years the celebrated Domesday Book; here Earl Godwin died suddenly at a banquet, for his sins it was said, and here in 1097 Anselm and Walkelin had a fierce contest about the claims of pope and king. The succeeding castle had round towers 30 or 40 feet wide, with walls from 8 to 10 thick, and had subterranean passages radiating in three directions. Henry III. ('of Winchester') was born here, and resided in the castle, which was then decorated with mural painting, statuary, and marble pillars. It had also a Mappa Mundi and Wheel of Fortune —the latter may have been turned into 'Arthur's Round Table,' which now hangs in the hall. Owing to a confusion between this Gwent and the one in Monmouthshire, Arthur's legends were transferred to Winchester, probably before Henry II.'s time, and this mistake caused Henry VII. to give the name of that hero to his eldest son, who was born in this castle. We first hear of the Table in Henry VI.'s reign; Henry VIII. showed it to Charles V. On the parapet of this castle Edward I. fixed a quarter of the last native Prince of Wales; Isabella there spiked the head of De-spencer Earl of Winchester, and she had Edmund of Woodstock decapitated on the green below. Here Raleigh, after his trial at Wolvesey, was imprisoned, and several of his companions were beheaded. The castle had become much dilapidated before the Cavaliers took refuge here—soon to surrender to Waller. The city and castle were retaken by the royalists, but finally yielded to Cromwell, who was here in person in 1645. One tower of the castle remains, with the fine hall 110 feet long, adorned with pillars of Purbeck marble. For 400 years after the Conquest the parliaments of England occasionally sat in it, and now it is used as a law-court.

The fantastic cathedral of the Saxons did not accord with Norman ideas, and Bishop Walkelin, a kinsman of William, demolished it, and built (1079–93), partly perhaps on the same site, a dark and ponderous pile. He commenced two western towers, the foundations of which have been traced. The central tower fell in 1107, but was soon rebuilt. As there are no quarries near Winchester, the stone for this and for the castle was brought from the Isle of Wight. This great edifice forms the substantial part of the present cathedral, and is visible in places. The Early English retro-choir still exists, built by Bishop de Lucy seventy years later. But 250 years produced dilapidations, and Bishop Edington commenced to renovate in the Perpendicular style, building the west porch and three windows in the aisles. Wykeham, his successor, carried on the work, finished the south aisle, and began the north. He pulled down the heavy triforium, and carried the pillars up to a great height, casing the round Norman ones; replaced the small round-headed clerestory windows with large pointed lights, and added an arched stone-groined roof, producing by this transformation the finest Perpendicular nave extant (see PERPENDICULAR). The work was completed by Cardinal Beaufort and Bishop Wayneflete. Specially interesting are the monuments and unrivalled chantries in this cathedral. In the centre of the choir stands an ancient tomb, said to be that of Rufus, but more probably that of de Blois. We may also notice those of Bishops de Lucy, de la Roche, Edington, Wykeham, Cardinal Beaufort, Wayneflete, Langton, Gardiner, Fox, North, Jane Austen, and Izaak Walton. The resting-places of the Saxon kings and bishops are unique—coffers perched on the partition walls of the choir. This collection was commenced by Bishop de Blois—two of whose chests remain, and was completed by

Bishop Fox, but some of the names are probably not correctly inscribed. In the Civil War the soldiers pillaged the cathedral, and, knocking down the chests on the north side, scattered the bones and used them for breaking the windows. This cathedral is the longest in Europe (556 feet). It has an ancient sculptured font said to have been presented by de Blois. The foundations having shown alarming signs of giving way, an extensive restoration, including the underpinning of the fabric with concrete, was carried out in 1906–12. In the library are some Anglo-Saxon charters, 12th-century books, bishops' rings, and other treasures.

A great impulse was given to education when in 1369–93 Winchester College was founded here by Wykeham. Some monks had previously given instruction, but nothing on a grand scale had been attempted. This foundation, called the 'New College,' was original in that it was non-monastic, and was in connection with a college at Oxford. It was intended for priests, and especially for those of limited means. The building, placed in the Soke or Liberty, a district under episcopal jurisdiction, was protected by the vicinity of the cathedral, monastery, watch-house, and Wolvesey Castle, but the site was so marshy that it was partly erected on piles. This edifice is that at present existing, with the exception of the chantry chapel, schoolroom, and tower. At the entrance of the kitchen stands the picture of the Trusty Servant —the present costume is that of the 18th century, though the picture is supposed to have been placed here by Johnson, head-master in 1560, and is a copy from the French. The hall is magnificent, 53 feet in length, with oak panelling and fittings. Here little flat squares of board, formerly the dinner plates, are still used for bread and butter. In the schoolroom, built by Warden Nicholas (1687), stands the celebrated signboard painting, as old as the middle of the 15th century, informing the schoolboy that he must learn, leave, or be flogged with a four-twigged rod. The foundation was for a warden, ten fellows, three chaplains, an usher, and seventy scholars. In 1857 the fellowships were reduced to six. Here the system of 'monitors' originated, and they alone, about twenty, were allowed to have fags. Until the middle of the 16th century the boys' beds consisted of some straw thrown on the concrete floor. There were always some boys who were not on the foundation, and as they increased 'Old Commoners' was built in 1730 for their accommodation. Dr Moberly built in 1838 a head-master's house, new halls and dormitories, the last-named afterwards turned into class-rooms. Many great men have been educated at Winchester, as Archbishops Warham and Howley, Sir Thomas Browne, Bishop Ken, the poets Collins, Warton, Young, Otway, and Bowles, Lowth of the Commentaries, Lemprière of the Dictionary, Dr Arnold of Rugby, Sydney Smith, and Lord Sherbrooke.

There are two hospitals in Winchester dedicated to St John, and said to have been founded by Birinus; one has been lately rebuilt, the other has a fine hall, and some Decorated windows. Portions of the city wall, mostly built in the reigns of John and Henry III., still remain, and two of the gates. Several of the town houses are ancient; the Butter Cross dates from Henry VI.; and close to it an old clock projects over the High Street in front of the former guildhall. The city once extended to St Cross, Weeke, Worthy, and Magdalen Hill, and in the reign of Henry I. had 20,000 inhabitants, but declined so much after being sacked in 1265 that it has but now regained that amount, the pop. being 13,704 in 1851, and 23,791 in 1921. A free library was established in 1851. A mile distant stands the interesting hospital of St Cross, founded in 1132 by De Blois, partly from the spoils of Hyde Abbey; but nearly all the present buildings were erected by Cardinal Beaufort.

See Dean Kitchin's *Winchester* (1890); *Royal Winchester*, by L'Estrange (1889); two books by the Misses Bramston and Leroy (1882–93); the Diocesan History, by Benham (1884); Canon J. Vaughan (1919) on the Monuments; Warren's *Winchester Diocesan Kalendar*. On the College, see *Winchester College*, by Old Wykehamists (1894); Tuckwell, *The Ancient Ways* (1893); Adams, *Wykehamica* (1878); Kirby's *Winchester Scholars* (1888) and *Annals of Winchester College, 1369–1892* (1892); Holroyd, *Winchester Commoners* (1891); Wrench, *Winchester Word-book* (1891); Cook, *About Winchester College* (1917); *Winchester College* by the Winchester College Archæological Society (1926); and histories by Leach (1899) and Townsend Warner (1901). See also WYKEHAM.

Winchester, an independent city, capital of Frederick county, Virginia, 80 miles N. by W. of Washington. During the civil war it was the scene of frequent conflicts, and occupied in turns by the Federal and Confederate armies. Pop. 6000.

Winchilsea, ANNE FINCH, COUNTESS OF, poetess, was daughter of Sir W. Kingsmill of Sidmonton near Southampton, and wife of Heneage Finch, who succeeded as fourth earl in 1712. She was a friend of Pope, Rowe, and other poets, and herself wrote poetry—her longest poem, on 'Spleen,' in Cowley's manner, was printed in Gildon's Miscellany in 1701. Her 'Miscellany Poems, written by a Lady,' appeared in 1713, and she herself died in 1720. Wordsworth (preface to 1815 volume) commends her pictures of external nature, and Edmund Gosse (*Gossip in a Library*, 1891) discovers in her a genuine vein of poetry. Her *Poems* were edited by Myra Reynolds (Chicago, 1903), by Middleton Murry (1927).

Winckelmann, JOHANN JOACHIM, first appreciative critic and historian of Greek art, was born of poor parents, 9th December 1717, at Stendal in Prussian Saxony. After studying for a time at a gymnasium in Berlin, he went in 1738 to the university of Halle as a student of theology, which he gave up for the study of medicine and mathematics at Jena. For a time a private tutor, and then rector of a school, as librarian by Count von Bunau he was taken to Nöthnitz, close to Dresden. He had frequent opportunities of inspecting the famous treasures of art accumulated there; he also made the acquaintance of artists and distinguished dilettanti; and the enthusiasm was awakened which determined his subsequent career. To the theory and history of art he now resolved to devote himself; and on being thrown into the society of the pope's nuncio, Cardinal Archinto, he was induced, after some hesitation, to become a Roman Catholic, on a promise of an appointment being procured for him which would enable him to proceed to Rome. Thither as librarian to Cardinal Passionei he repaired in 1755, having previously published at Dresden a treatise on the imitation of the antique (1754) which secured him a small pension from Augustus III. of Saxony. At Rome he prosecuted his studies with the utmost ardour, and every facility was afforded him. In 1758 he visited Naples to examine the celebrated remains of Herculaneum, Pompeii, and Pæstum, and went also to Florence for the purpose of cataloguing the famous collection of antique gems belonging to Baron de Stosch, a labour which occupied him for nine months. Soon after Cardinal Albani appointed him his librarian. The first-fruits of his studies in Italy appeared in his treatise on ancient architecture (*Über die Baukunst der Alten*, 1762), and two years afterwards the great work of his life, on which he had long been engaged, the History of Ancient Art (*Geschichte der Kunst des Alterthums*), was issued from the press of Dresden. This exposition of the

principles and history of Greek art may fairly be described as epoch-making, not for Germany merely but for Europe; and if in many points corrections and modifications of his statements have been made, all subsequent progress in æsthetics is largely an outcome of this work, which from the very first was studied with avidity by men like Goethe and Lessing. Winckelmann also gave to the world the result of his researches at Herculaneum, and in 1766 his *Monumenti Antichi Inediti*, an elaborate work with plates, besides an allegory and many contributions to the periodicals of the time. In 1763 he was made superintendent of all antiquities in and about Rome. In 1768 Winckelmann, by this time famous throughout Europe, set out to revisit Germany. His destination was Berlin; but after visiting Munich and Vienna (where he was received with flattering attentions by Maria Theresa), he resolved to return to Rome. On the way thither he was murdered in a hotel at Trieste (8th June 1768) by a fellow-traveller, Arcangeli, to whom he had shown some tempting gold coins and curios.

An edition of his works appeared in 1808–20; the fullest is that by Eiselein (12 vols. 1825–29). See the Life by Justi (1866–73), 2d ed. 1898; E. C. Gardner's *Handbook of Greek Sculpture* (new ed. 1905); and the histories of ancient art named at ART, SCULPTURE, &c.

Wind is air in motion, and is perceived either by its pressure and cooling effect on the human body or by its disturbance of visible objects such as the leaves of trees, smoke, sand, or flags. Numerically, wind is expressed by its velocity, which includes both its speed v, and its direction D: the speed is related to the pressure f, by the equation $f = \cdot 00072v^2$ in centimetre-gramme-second units, or $F = \cdot 003V^2$ if F is in lbs. per square foot and V is in miles per hour. In other words, a wind of 100 miles per hour exerts a pressure of 30 lb. per square foot on a flat surface of moderate extent transverse to the direction of the wind.

Strictly, wind includes vertical as well as horizontal motion of the air; but as the average velocity of the vertical motion is usually much smaller than that of the horizontal motion, the wind is generally assumed to be known if the horizontal motion is known; and in practical measurement of wind no account is taken of vertical currents.

Instruments.—Instruments for measuring the speed and direction of the wind are called anemometers. The majority of anemometers are actuated by the pressure of the wind, but the cooling effect has also been utilised in the hot-wire anemometer in which the change in temperature of a hot-wire as the wind blows past it is measured electrically. The anemometers most generally used are: (1) The Robinson, which consist of 4 hemispherical cups at the ends of two horizontal cross-arms; the speed of the cups depends upon their size and the length of the arms; it is usually between $\frac{1}{2}$ and $\frac{1}{3}$ of the speed of the wind. Recent investigations indicate that there is some advantage in using 3 cups, equally spaced, instead of 4. (2) The Dines Pressure Tube which depends upon the difference between (*a*) the pressure of the wind on the open end of a horizontal tube, and (*b*) the suction of the wind blowing past a ring of small holes around a vertical tube. This difference is approximately $\frac{1}{2}\rho v^2 (1 + 0{\cdot}4)$ where ρ is the density of the air, the two terms inside the bracket representing the contributions of (*a*) and (*b*) respectively. An example of the record from a Dines Pressure Tube Anemograph is given in the article on STORMS (q.v.). An illustration of the instrument itself is given in Figures 1 and 2.

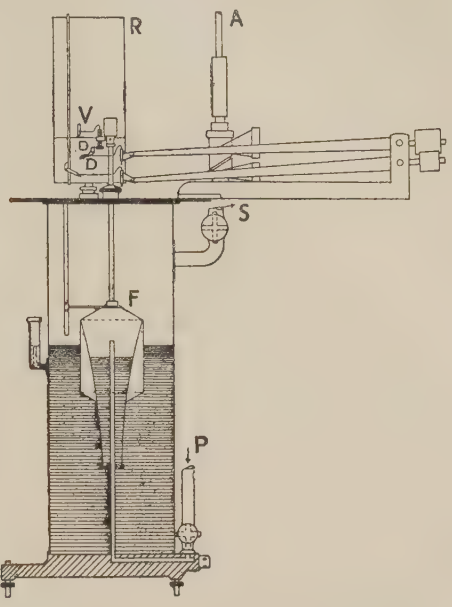


Fig. 2.—Dines Pressure-tube Anemometer. (Recording Apparatus.)

F is the special float.
R is the clock cylinder on which the chart is placed.
V is the pen which records the velocity of the wind.
D D are the pens which record the direction of the wind.
A is a rod connected to and turned by the vane of Fig. 1.

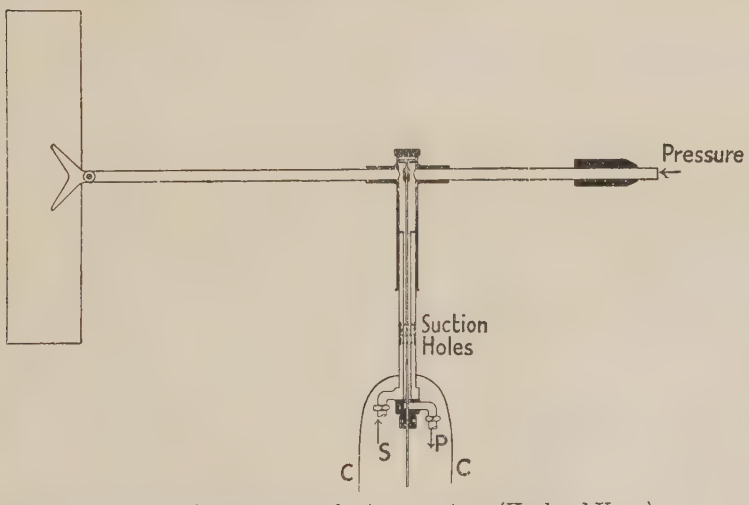


Fig. 1.—Dines Pressure-tube Anemometer. (Head and Vane.)

P is connected with the tube marked pressure and with the tube marked P in Fig. 2.
S is connected with the suction-holes and with the tube marked S in Fig. 2.
C is a bell-shaped cover to prevent the tubes P and S affecting the symmetrical flow of air past the suction-holes.

An instrument specially suitable for measuring light or moderate winds is the Air Meter. A small fan or windmill vane is rotated by the wind, and its revolutions recorded by a counting mechanism: this instrument can also be used to obtain the direction of the wind by turning the instrument until the fan ceases to rotate, which it does when it is in the direction of the wind.

The Swinging Plate Anemometer is a very simple instrument for measuring winds rather stronger than those for which the Air Meter is suitable. It consists of a smooth flat oblong plate ABCD, about 6 inches by 4 inches, supported at A and D, so that it swings freely about the axis AD. The plate is set so that the wind blows on the face ABCD and the pressure of the wind swings the plate backwards. The angle through which it is moved measures the strength of the wind. If the weight of the plate is W oz. and its size 6 inches by 4 inches, then the angle of swing θ, is related to the velocity of the wind, V, m.p.h., by the equation $V \cos\theta = 11\sqrt{W \sin\theta}$. For W = 4 oz. and V = 20 m.p.h. the angle of deflection is approximately 34°.

The velocity of the wind depends upon the position in which the measuring instrument is placed. If the record is to give a good idea of the general motion of the air in the neighbourhood, the instrument must be clear of obstacles which would shelter it in any direction or would seriously disturb and deflect the wind, e.g. a position on the top of a large building is bad for the second reason, while a position near a wood or a row of trees is bad for the first.

The speed of the wind near the surface of the earth varies rapidly with height. The following table gives the percentage strength at different heights, taking that at 20 feet as standard; the values are average values which apply in the daytime in a level open space free from trees and houses:

Height in Feet.	Percentage of Wind at 20 Feet.
1	40
2	56
5	75
10	87
15	95
20	100
25	103
30	106
40	113
50	116
100	130

Estimating the Wind.—Owing to the difficulty of finding suitable sites for anemometers in accessible positions, much attention has been given to the estimation of the speed of the wind by observation of its effects on various objects, and on the observer himself. It is indeed possible for an observer, who compares his personal estimate of the wind with the simultaneous records of an instrument, to attain a high degree of accuracy; for speeds in the neighbourhood of 10 to 20 miles per hour (m.p.h.) he can, after practice, estimate the speed within 1 or 2 m.p.h.

One of the earliest attempts at devising a scale of wind force was made by Admiral Sir Francis Beaufort in 1806. Before that time the wind at sea had been described by various descriptive terms. The following are quoted in 1769 in an account of the Great Storm of 1703 (see STORMS, p. 724): 'Stark calm; calm weather; little wind; a fine breeze; a small gale; a fresh gale; a topsail gale; blows fresh; a hard gale of wind; a fret of wind; a storm; a tempest.' Beaufort's scale of 12 numbers, in addition to calm, is given in the table below. The approximate speeds and pressures corresponding with the different numbers of the scale have been added; they refer to a height of 20 feet above level ground and to approximately the same height above the surface of the sea. Many meteorologists prefer the term High Wind to Moderate Gale for Force 7, and it is now the general practice to reckon as gales only winds of Force 8 or more. (In British practice the wind is usually taken to refer to a height of 30–40 feet above the surface, and the corresponding velocities and pressure are in that case slightly higher. They are shown in the last two columns of the table.)

BEAUFORT WIND SCALE WITH EQUIVALENT SPEEDS AND PRESSURES.

Beaufort Number.	Explanatory Title.	Mean Values at a Height of 20 Feet.			Mean Values at a Height of 30-40 Feet.	
		Speed m.p.h.	Pressure. Millibars.	Pressure. Lb. per Sq. Foot.	Speed m.p.h.	Pressure. Lb. per Sq. Foot.
0	Calm	0 (0–1)	0	0	0	0
1	Light Air	2 (2–3)	0	·01	2	·01
2	Slight Breeze	5 (4–7)	·04	·08	5	·08
3	Gentle Breeze	9 (8–11)	·12	·24	10	·28
4	Moderate Wind or Breeze	14 (12–16)	·28	·58	15	·67
5	Fresh Wind or Breeze	19 (17–21)	·52	1·1	21	1·3
6	Strong Wind or Breeze	25 (22–27)	·91	1·9	27	2·3
7	High Wind or Moderate Gale	31 (28–33)	1·4	2·9	35	3·6
8	Gale or Fresh Gale	37 (34–40)	2·0	4·1	42	5·4
9	Strong Gale	44 (41–48)	2·8	5·8	50	7·7
10	Whole Gale	52 (49–56)	3·9	8·1	59	10·5
11	Storm	61 (57–65)	5·3	11·2	68	14·0
12	Hurricane	Above 65	Above 6·1	Above 12·7	Above 75	Above 17·0

The figures in brackets are the limits of speed for each number. Thus for a height of 20 feet any speed from 22–27 m.p.h. inclusive is reckoned as Force 6.

There are simple relations connecting the speed v, and the pressure f, of the wind at a height of 30 to 40 feet with the corresponding Beaufort Number B. For c.g.s. units they are

$$f = 5B^3 \text{ and } v = 8{\cdot}36\sqrt{B^3}.$$

For F in lbs. per square foot and V in miles per hour the relations are:

$$F = \frac{1}{100}B^3 \text{ and } V = 1{\cdot}87\sqrt{B^3}.$$

General Winds.—Broadly speaking, the general wind system of the globe may be described thus: (*a*) an equatorial region of relative calm; (*b*) two tropical belts north and south in which there are systems of comparatively steady winds from the north-east in the northern hemisphere and from the south-east in the southern hemisphere; these systems, known as Trade Winds, though covering vast regions, are not continuous around the tropical

belts. The best examples of the systems are the south-east trades of the South Atlantic Ocean, which blow with extraordinary regularity, and the south-east trades of the Indian Ocean. Next to these two tropical belts are (*c*) two belts of relatively calm conditions (Horse Latitudes) in which are situated the nearly permanent anti-cyclones such as that of the Azores; (*d*) north and south of these latter belts are the temperate latitudes characterised by large cyclones or depressions. In these latitudes the prevailing winds are south-west and north-east, but with an appreciable admixture of north-west and south-east winds. In the northern hemisphere the south-west winds predominate in regions to the south of the main track of depressions, while north-east winds predominate in regions to the north of these tracks.

In the southern hemisphere, where there are no large masses of land in the temperate zone, and depressions move more regularly from west to east, the westerly winds on their equatorial side are more constant than in the northern hemisphere, and blow with great regularity and force in the neighbourhood of latitude 40°; hence the term 'Roaring Forties' which mariners apply to these regions.

The effect of the depressions of temperate latitudes extends practically up to the pole, in the north Polar region; near the South Pole the Antarctic Continent modifies conditions very considerably, and tends to produce a Polar anticyclone with mainly easterly winds at the surface.

Local and Seasonal Winds.—There are many winds characteristic of particular places, times of day, or seasons; some of these are stormy or turbulent, and are described under STORMS (q.v.). The most notable of the local and seasonal winds of a relatively steady and moderate character are the monsoon winds of India, viz. the south-west monsoon, lasting approximately from the beginning of June to the end of September, and the north-east monsoon, lasting approximately from November to February. The south-west monsoon is very steady in direction, though over the major part of India it is more nearly west than south-west; its force over India is 3 to 5 on the Beaufort scale, but over the Arabian Sea it reaches force 6 or 7. The south-west monsoon forms part of the cyclonic circulation around an area of low pressure centred in north-west India on the borders of Afghanistan. This depression develops gradually during the spring months, with a circulation of comparatively dry air raised to a high temperature by solar radiation. At the end of May or beginning of June the circulation has extended so far that the air brought to India by the westerly current no longer originates from the Asiatic area but comes from the south-east trades, which have swept over the long reaches of the Indian Ocean and are saturated with water vapour. The south-west monsoon is of greater economic importance to-day than any other seasonal wind owing to the rainfall which it brings to India; large populous areas would become desert without it.

Another seasonal wind of great regularity is the northerly wind which blows in winter across the Yellow and East China seas, and covers the small islands at the southern limit of Japan with an almost continuous pall of cloud.

The Harmattan wind of the east coast of Africa, locally known as the 'Doctor,' blows from the north-east during the winter months, November to March, along the coast of Upper Guinea from French Guinea to the Cameroons. It is very dry, and, generally speaking, healthy; but it usually brings with it fine sand, which, entering through the crevices of doors and windows, covers everything with a film of dust.

Trade Winds.—The Trade Winds, which blow in the tropics from the north-east in the northern hemisphere and from the south-east in the southern hemisphere, were of the greatest importance to mariners in the days of sailing-ships, and one of the first meteorological maps published was a chart by the astronomer Halley in the Philosophical Transactions of the Royal Society for the year 1686, in which he portrayed the systems of Trade Winds over the oceans.

In the Atlantic Ocean the north-east Trade blows with an average speed of about 10 m.p.h., but it undergoes considerable variation in the course of the year. In the autumn months the speed is only about 7 m.p.h., whereas in the spring months it is about 12 or 13 m.p.h. The south-east Trade blows with an average speed of about 15 m.p.h., and the variation is not quite so marked in the course of the year as the variation of the north-east Trade. In the autumn months the speed is about 17 m.p.h., and in the spring months about 13 m.p.h. These speeds refer to a height of about 30 feet above the sea.

In the North Pacific Ocean the north-east Trade blows with an average speed of between 15 and 20 m.p.h. The annual variation appears to be less than in the north-east Trades of the Atlantic. The maximum strength, about 17 m.p.h., is in the early months of the year; and the minimum strength, about 13 m.p.h., is in the late summer and autumn.

The height to which the Trade Winds extend varies greatly. Near the northern limit of the north-east Trade and the southern limit of the south-east Trade these winds are comparatively shallow, but nearer the equator they extend to great heights. Observations at Hawaii, in the Pacific, latitude 21° N., show that in the winter, when this place is near the northern limit of the Trades, there is a preponderance of westerly winds at a height of 10,000 feet, whereas in the summer, when Hawaii is in the middle of the Trades, westerly winds do not predominate until a height of 20,000 feet is reached. At Guam, on the other hand, which is also in the Pacific in latitude 13°30′ N., easterly winds predominate throughout the year, even to heights of 20,000 feet or more.

The speed of the wind in the upper air over Hawaii was found to be between 15 and 20 m.p.h. up to a height of 20,000 feet. At Guam the speed was between 15 and 20 m.p.h. up to heights of 6000 feet, and between 10 and 15 m.p.h. at greater heights.

Winds at Higher Altitudes.—The fact that the wind at higher levels of the atmosphere differed appreciably from the wind near the surface was known long ago from the observation of clouds; thus an old rule said, 'If you face the wind the clouds will appear to come from your right-hand side.' Modern methods of observing the wind at great heights are numerous, but the most general method is by watching the motion of a rising rubber balloon, filled with hydrogen and free to travel with the wind. Such a balloon rises with a practically constant vertical velocity. The angular altitude and bearing of the balloon are measured by a theodolite specially designed for the purpose (de Quervain theodolite), and the position of the balloon at successive heights is thence readily calculated; the horizontal distance between the successive positions is a measure of the wind in the intervening layer.

Another method susceptible of great accuracy and rapidity of measurement is to measure the drift of the patch of smoke formed by the bursting of a shell fired from a high-angle gun; the drift of the smoke is a measure of the wind at the level at which the shell bursts. The observation is made

by noting the time required for the image of the smoke, seen in a horizontal mirror, to pass across a measured distance on the surface of the mirror; the image is viewed in line with a point at a fixed height above the mirror.

Both of these methods can be utilised only when clouds are sufficiently high or broken to permit of direct observation. The wind in or above clouds has been measured by an elegant method for ascertaining the position of a balloon carrying explosive charges which burst at intervals; the method depends on the difference between the times at which the sound of the explosion arrives at four or five different posts of observation. The wind above clouds has also been measured by an aeroplane flying at known speed along a line of patches of smoke formed by shells fired at successive intervals to burst in approximately the same position; the distance between successive patches is a measure of the wind at that level.

The results of observations by these and other methods show that on the average the wind increases rapidly in the first 2000 feet above the surface and more slowly afterwards: and accompanying the increase in speed is a change in the direction, usually in a clockwise direction in the northern hemisphere, a south wind at the surface tending to become a south-west or west wind at high levels. The change in the southern hemisphere is in the reverse direction.

Causes of Change of Wind with Height.—There are two different causes responsible for the changes of wind just mentioned. The change in the first 2000 feet is a transition from the wind retarded and deflected by the earth's surface to the geostrophic or gradient wind referred to in the article on Storms (p. 713). This transition is effected in the main by eddies or small whirls in the atmosphere, which move up and down; those moving down carry with them the swifter moving air from above, and *vice versa* with those moving up. The process is susceptible of mathematical investigation, which indicates that the geostrophic speed ought to be reached at a considerably lower level than the geostrophic direction; and this theoretical result is confirmed by observations. A further result is that the surface wind is determined practically entirely by this transfer of moving air from above and is not *directly* produced, as used to be supposed, by the difference of barometric pressure at the surface. The strength and direction of the surface wind are in fact such that there is a balance between the frictional resistance of the earth's surface and the forward drag due to the quicker-moving air brought down by the eddies. This is a result of fundamental importance, and explains at once such phenomena as the decrease of surface wind at night and the increase in the middle of the day. (See next column). The wind at a height of 30–40 feet in an open situation inland is about 40 per cent. to 50 per cent. of the geostrophic wind: over the sea it is about 60 per cent. to 70 per cent. of the geostrophic wind. These are rough averages; in individual cases the percentage may fall to zero or rise to 100 per cent.

The second cause, which is responsible for the gradual change of wind at greater heights, is the horizontal difference of temperature in the atmosphere. The simplest way to understand how this affects the wind is to take a case where there is no difference of surface pressure over a considerable area; in that case the air will be practically calm at the surface. If the mean temperature of a column of air 12,000 feet high is 40° F. in one place in this region and 50° F. in another the barometer at 12,000 feet will be about 3 millibars ($\frac{1}{10}$th inch of mercury) lower over the colder place than it is over the warmer; thus differences of pressure will exist at 12,000 feet, and in consequence there will be wind at 12,000 feet although there is no wind at the surface or even at heights of 1000 or 2000 feet above the surface. The isobars at 12,000 feet will in fact be along the isotherms of mean temperature with the region of low pressure over that of low temperature (not surface temperature, but mean temperature of the whole layer from the surface to 12,000 feet).

If the wind at any height arising from the differences of temperature is called the 'thermal' wind, then the geostrophic wind at that height will be the resultant of the thermal wind and the geostrophic wind computed from the surface isobars; due allowance must be made in strict computation for the change which arises from the vertical gradient of temperature. If there were no horizontal variation of temperature, then the geostrophic wind at any height would be proportional to the absolute temperature at that height; thus when there is horizontal variation of temperature the geostrophic wind W_h will be the resultant of the thermal wind W_t and of $\frac{T_h}{T_s} W_s$ when T_h and T_s are the absolute temperatures at a height h and at the surface respectively, and W_s is measured directly from the surface isobars.

In the northern hemisphere the thermal wind always blows counter-clockwise around the cold region. Hence the thermal wind around the Polar regions will be a west wind, since the atmosphere is colder over the Polar area than in temperate latitudes, not merely at the earth's surface but up to heights of 20,000 feet or more. (At very great heights conditions are reversed, and the lowest temperatures are over the equator.) Thus whatever wind is blowing in the lower levels of the atmosphere in temperate latitudes will usually have superposed on it at greater heights a westerly component. This applies also to higher latitudes up to lat. 70°–80°. If the lower wind is itself westerly the wind at greater heights will be also westerly but stronger: if the lower wind is easterly it will decrease in speed as the height increases and will frequently change into a westerly wind at great heights. Thus in the Antarctic the general direction of the wind at the level of Mount Erebus (lat. 77½° S.; height, 13,300 feet) is west-south-west although there is a predominance of easterly winds at sea-level. There are exceptions to this general rule; one arises when a large mass of cold Polar air moves south so that the isotherms run north-south instead of west-east. A notable case of an intense thermal wind of this character occurred in the autumn of 1917 (19th–20th October) when German airships endeavouring to raid England were carried far south by a strong northerly wind at 20,000 feet. As the wind at sea-level in the region concerned was very light or even southerly, the strong upper wind was wholly thermal in origin; there was, in fact, a large mass of cold air east of England and France and a large mass of very warm air over Ireland and the Atlantic west of France.

Diurnal Variation of Wind.—Mention has been made of the diurnal variation of wind at the earth's surface; the variation is well marked inland. Over the sea and on small islands it is much smaller; thus at St Helena the mean velocity is only about 15 per cent. higher at midday than it is at midnight, while at Kew Observatory in summer the midday wind (9 m.p.h.) is more than double the midnight wind (4 m.p.h.), and even in winter the midday wind (9 m.p.h.) is 30 per cent. greater than the midnight wind (7 m.p.h.) The time of maximum varies a little, but is usually about 2 P.M., while the minimum occurs in the early morning between midnight and sunrise.

The character of the diurnal variation changes completely at a comparatively low altitude; thus at the top of the Eiffel Tower the maximum wind occurs near midnight, and the minimum about 9 or 10 A.M. in summer and about 2 P.M. in winter; in summer the wind at midnight is on the average about 20 m.p.h., while in the forenoon it is only about 12 m.p.h.; in winter the difference is much less; the midnight wind is about 24 m.p.h. and the midday wind about 19 m.p.h. The explanation is simple; in the daytime the surface-layers are warmed and exchange of air between the surface and higher levels is thereby facilitated; the slow-moving air from the surface retards the motion of the layers into which it is carried, while the surface motion is accelerated by the quicker-moving air which is brought down from the higher levels; at night the surface air cools and tends therefore to remain at the surface; vertical exchange of air is effectively barred; the friction of the earth's surface slows down the surface air, while the upper layers move freely without any retardation. The time at which the minimum velocity occurs in the upper layers depends upon the height and season; at the level of the Eiffel Tower there is little difference *in winter* between day and night so far as the exchange of air with still higher levels is concerned; consequently the retardation reaches its maximum (and the wind velocity its minimum) at about the time when the surface temperature is highest; in summer the effect of the surface warming is to promote exchange of air to heights considerably greater than 1000 feet, and after about 10 A.M. the quicker-moving air brought down from the greater height to the 1000 feet level more than balances the slower-moving air rising from below. Thus after 10 A.M. the wind on the Eiffel Tower begins to increase again; although at greater heights it will go on decreasing until about 2 P.M.

Vertical Currents.—Mention has been made of the small *average* value of vertical currents in the atmosphere. If these currents are measured through layers of the atmosphere 500 feet thick, they are found usually to be less than 2 or 3 miles per hour. Upward currents are rather stronger than downward currents and sometimes reach speeds of 10 or 15 miles per hour; greater average speeds have not been directly measured, but it is known with certainty from the occurrence of hail that upward currents stronger than 20 miles per hour exist in thunder clouds and extend over considerable vertical distances. The restriction to *small* values even at lower levels no longer holds if the currents are measured over very short distances or times. Brief gusts in the vertical direction may be very intense; and both theory and experiment indicate that the *variations* in vertical velocity are as great as the variations in horizontal velocity; although in the former case (of vertical velocity) the *mean* value about which the variation occurs is practically zero, while in the latter case (of horizontal velocity) the mean value is usually as great as the range of variation or greater. The main point is that the speeds of vertical gusts, both upward and downward, at 30 or 40 feet above the ground will increase with the strength of the horizontal wind and will reach values of 20 or 30 miles per hour in gales or storms; these gusts usually extend only over a small area, but they may affect seriously the landing of aeroplanes or parachutes.

Gustiness.—The gustiness of the wind has already been briefly mentioned; it is not very easy to get a perfectly satisfactory measure of it; but some comparative statistics have been obtained from the records of Dines Pressure Tube Anemometers. In these the gustiness factor is taken to be the ratio of the width of the ribbon-like record to the mean speed; the width of the record measures roughly the average difference between the speed of the wind in the highest gusts and the calmest lulls. This factor varies greatly as the following table indicates:

Place.	Factor.
Dyce (near Aberdeen)	1·3
Kew Observatory	1·0
St Mary's, Scilly	0·5
Holyhead (Salt Island)	0·5
Shoeburyness, W. wind	0·8
E. wind	0·3
Southport (Marshside)	0·3

At Dyce the vane of the anemometer was 15 feet above the top of the trees in a wood. This is the most gusty place of all. At Shoeburyness a west wind blows from the land and an east wind from the sea, and the west wind is much more gusty than the east wind. The gustiness decreases with height; at an inland station it is about 30 per cent. less at 100 feet than at 30 to 40 feet.

See *Observers' Handbook*, Meteorological Office, London; *Quarterly Journal*, Royal Meteorological Society; Sir N. Shaw, *Manual of Meteorology*; Geddes, *Meteorology*.

Windau, or VINDAU (Lettish *Ventspils*), a Lettish seaport, in Courland, 120 miles NE. of Memel; pop. (1925) 16,384.

Windermere, or WINANDERMERE, the largest lake in England, is in the county of Westmorland, its western shore and much of its eastern forming the boundary with Lancashire. It is nearly 11 miles long and about 1 mile in extreme breadth; is fed by the Brathay and the Rothay, the waters of which become united before entering the lake, and by the streams which drain the neighbouring lakelets of Esthwaite, Troutbeck, and Blelham; and, lying 134 feet above sea-level, discharges its surplus waters southward into Morecambe Bay by the Leven. Next to Wast Water, Windermere is the deepest of all the English lakes, its greatest depth being 219 feet, while Wast Water is 258 feet deep. It contains a number of islands, the largest being 28 acres in area. Soft rich beauty is the principal characteristic of the islands of the lake, of the wooded shores, and of the scenery around; there being a total absence of that wildness and sublimity which characterise some of the other lakes, except at the north end, where Langdale Pikes, Sca Fell, and Bow Fell stand forward prominently in the landscape. The east and west shores are bounded by gentle eminences exuberantly wooded, and numerous villas and cottages peeping out of the woods give an aspect of quiet domesticity to the landscape. About a mile from Waterhead, at the north extremity of the lake, is the town of Ambleside, 1½ mile north-west of which is Rydal, the residence of the poet Wordsworth; in the vicinity of Waterhead is Dove's Nest, the cottage at one time occupied by Mrs Hemans; farther down the east shore is Elleray, famous as the residence of 'Christopher North'; and half-way down the lake, on the eastern shore, is Bowness. The village of Windermere lies nearly a mile from the east shore of the lake, and 300 feet above its level. The urban district, which includes Bowness, has a pop. (1921) of 6496. See LAKE DISTRICT, with map, and works there cited.

Windflower. See ANEMONE.

Windgalls are puffy swellings, most common about the fetlock-joints of animals, particularly of horses, resulting from an increased secretion of synovia arising from overwork, particularly on hard roads; they are generally unassociated with any pain, heat, or lameness, and are not generally considered to be causes of unsoundness, but are always a blemish. If the horse be young they may disappear if the animal be allowed a long rest and the parts blistered once or twice. Old horses having

windgalls are generally kept at work, the legs being bandaged when in the stable.

Windham, WILLIAM, statesman, was born of an ancient Norfolk family at London, 3d May 1750. He was educated at Eton, at Glasgow University, and University College, Oxford. After the usual course of travel he began to acquire notoriety as an opponent of the administration of Lord North, and in 1784 was returned to parliament for Norwich. In 1783, on the formation of the Portland ministry, remarkable for the coalition of Lord North and Mr Fox, he had become principal secretary to Lord Northington, then Lord-lieutenant of Ireland, but ill-health soon obliged him to resign. He followed Burke in his view of the French Revolution, and in 1794 he became secretary-at-war under Pitt. He went out with Pitt in 1801, and denounced Addington's peace of Amiens (1801) in a speech of splendid eloquence. This lost him his seat for Norwich, but he was elected for St Mawes in Cornwall, and on the return of the Grenville party to power (January 1806) he became war and colonial secretary. He helped Cobbett (q.v.) to start his *Political Register* (January 1802), carried a scheme for limited service in the army (1806), and at the general election in October 1806 found a seat in New Romney, and next year at Higham Ferrers. He went out of office in 1807, when the Portland administration was formed, having previously declined the offer of a peerage, and strongly denounced the expedition against Copenhagen, and afterwards the disastrous Walcheren Expedition. In 1808 a clause was introduced by his successor Lord Castlereagh into the Mutiny Act, permitting men to enlist for life, contrary to Windham's scheme of limited service, which was, however, readopted in 1847. Windham died June 4, 1810.

Windham was a brilliant talker, an excellent speaker, and in the field of letters Dr Johnson, who loved him much, called him *inter stellas luna minores*. He was a member of the famous Literary Club, and he was one of the group around Johnson at his death. All his qualities and talents were neutralised by an intellectual timidity, a morbid self-consciousness, and a fondness for paradox. In his lifetime he was nicknamed the 'weather-cock.' In 1802 he opposed the abolition of bear-baiting 'as the first result of a conspiracy between the Jacobins and Methodists to render the people serious'; like his correspondents Cobbett and Earl Grey he was a supporter of pugilism and attended prize-fights.

His speeches were collected in 3 vols. in 1806, with a Life by his secretary Thomas Amyot; his *Diary from 1784 to 1810* was edited by Mrs Henry Baring (1866), and the *Windham Papers* were published in 1913 (2 vols.).

Windhoek, or WINDHUK, capital of South-west Africa, stands amid the hills in the centre of the territory at an altitude of 5600 feet. The town, which is a railway centre, has extensive government buildings and several hospitals and schools. Fruit is grown in the neighbourhood. Pop. about 8000 (4000 Europeans).

Wind-instruments. See MUSIC and BAND.

Windisch, ERNST (1844–1918), German philologist, was born at Dresden, and educated there and at Leipzig, where he specialised in the study of Sanskrit. After spending two years in London, cataloguing the Sanskrit manuscripts in the India Office Library, he obtained various professorial appointments in Germany, becoming in 1877, professor of Sanskrit at Leipzig. His principal works in Sanskritology include *Mara und Buddha* (1895), *Buddha's Geburt* (1908); he also edited the *Iti-Vuttaka* for the Pâli Text Society in 1890. But perhaps of even greater importance are Windisch's researches in Irish philology. His *Kurzgefasste irische Grammatik* (1879) was translated in 1882, while his monumental series of *Irische Texte* (in the editing of which he later had the assistance of Stokes) began in 1880. *Das keltische Brittannien* appeared in 1913.

Windischgrätz, PRINCE (1787–1862), Austrian field-marshal, played a conspicuous part in suppressing the revolution of 1848–49 at Prague and Vienna, and as generalissimo in Hungary defeated the Hungarians in several battles, but was superseded after his defeat by them at Gödöllö.

Windlass, a modification of the wheel and axle, used for raising weights, lifting water from a well, or on shipboard for hoisting the anchor. A usual form is a horizontal beam supported by spindles moving in collars or bushes, and forced round by handspikes inserted in holes in the beam. Pawls acting on a toothed-wheel prevent the beam from slipping. Windlasses are often worked by steam-power.

Windmill. A windmill is a mill in which machinery is caused to function by the wind acting upon sails or vanes; it shares with the sailing-ship the distinction of being one of the only two agencies by which the natural force of the wind is utilised for the development of power; both have played important parts in the past in human development; both are still used, though, relatively to other agencies employed for the development of power, on a very small scale; but it is quite possible that both will be revived in the future.

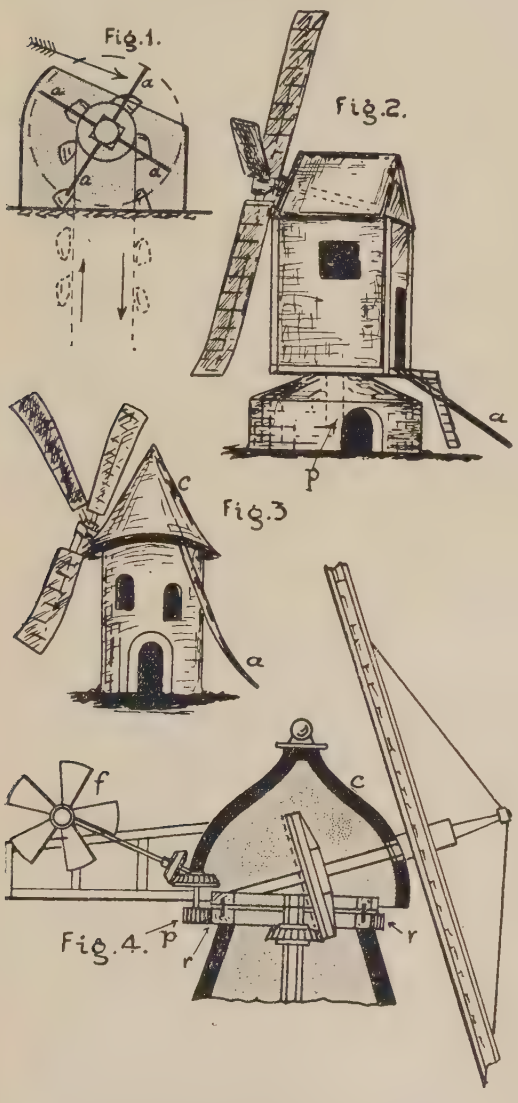
The windmill has been used in the past for the grinding of corn, the pumping of water, and, in the tropics, for the crushing of sugar-cane for the extraction of its juice. It is still used for all these purposes, though on a much reduced scale; while there have been added, in recent times, the sawing of timber in North America, and the production of electric light and power, on a small scale, in Denmark.

There are more windmills in use to-day than at any previous period, but their character and location have changed. The steam-engine, with its constancy and reliability, has largely displaced the old massive type of windmill which for centuries was a picturesque object of the country here and on the continent of Europe. Lighter types of windmills have been devised and extensively adopted for farm use, particularly in the United States of America, but even these have found a severe competitor in the oil-engine; while electricity, developed from water-power, is now beginning again, particularly in the United States, to take the place of both.

It is unlikely that we shall ever learn where or when or by whom the windmill was invented. There is a reference to what appears to have been a windmill in Persia in the 7th century, but as there is no other trace of any such Persian appliance, and there are clear accounts of Persian water-wheels, it would seem probable that waterwheels and not windmills were meant in the record to which reference has been made. There is a still earlier and very curious reference to a windmill in the writings of Hero of Alexandria, B.C. 150; the mill is said to have been used for blowing an organ. The windmill does not appear to have been known to the Romans; and the picturesque notion that it was brought to Europe by the Crusaders is no longer held. It seems possible that we had windmills in Great Britain when the first Crusaders left these shores in 1095. Modern research has not affected the conclusion reached by Beckman in his *Century of Inventions*, a hundred years ago, that the windmill arose in Europe.

The earliest use of the term windmill that has been found is in the Chronicle of Robert of Gloucester

(about 1297); but there are earlier references in Latin. Thus, in a French deed of A.D. 1105, a convent is authorised to erect water and wind mills, the latter being styled *molendinum ad ventum;* while in our own Dugdale's *Monasticon Anglicanum* there are several references to windmills a little later in the same century. From the close of the 12th century the development of the windmill can be clearly traced, the history having been assisted by the fact that the church early discovered in the windmill a special source of tithes and other dues. Sometimes the church and the barons came into conflict over windmills, the point in dispute being as to which had the prior title to be considered the owner of the wind. There was a famous struggle in the 14th century in the Low Countries, between the Bishop of Utrecht and the Baron of Wöerst, as



to which of them owned the wind of Zeeland. The bishop maintained that no one had any right in the wind of Zeeland except himself and his church at Utrecht.

The most primitive form of windmill consisted of four or five long wooden boards forming vanes, *a*, attached lengthwise to a horizontal axle and partially enclosed in a wooden trough, as indicated in fig. 1. The wind acting on the exposed vane blew it round. This windmill appears to have been used in conjunction with a sort of endless chain of small buckets, which lifted water from a well and discharged it as the buckets passed round at the top. It was a crude and clumsy device, without any convenience for adjusting it to a changed wind; but there was this about it—when the wind did not serve, it could be worked by hand. It was, of course, quite superseded by the standard arrangement of wind-sails revolving in a vertical, or slightly inclined, plane on an axle projecting from a mill-house, with which we have long been familiar. The need of some convenient means of adjusting the sails to suit a change in the direction of the wind has been present to the minds of builders from very early times. Probably the first plan adopted was in connection with pumping water, and consisted in simply putting the whole mill on a float in water and mooring it by ropes to the shore in such way that it could be turned about to suit the wind. It was a cumbrous and inconvenient plan, and was soon displaced by the arrangement shown in fig. 2, where the whole mill-house can be turned as required on the pivot, *p*, by means of the long sweep or handle, *a*. This arrangement was followed by the plan indicated in fig. 3, in which the mill-house is built with a cap, *c*, carrying the sails and free to revolve, the necessary adjustment being made by the sweep, *a*. Mills as in figs. 2 and 3 are still in use, but the arrangement for keeping the sails up to the wind in the best British mills is shown in fig. 4, and is automatic. As in the old Dutch and French type of mill shown in fig. 3, the mill-house has a cap, *c*, adapted to revolve. Attached rigidly to the cap is a small wind-wheel, *f*, fitted to revolve in a plane at right angles to that in which the main sails revolve. This fan-wheel is connected by gearing to the pinion-wheel, *p*, which engages with the toothed rack, *r*, attached to the frame at the top of the mill structure. So long as the wind blows normal to the sails—that is, perpendicularly to the plane in which the sails revolve, or in other words, along lines parallel with the axle of the sails—the fan-wheel, *f*, is not affected, but the moment the wind blows otherwise, sideways to the fan-wheel, that wheel is set in motion, and the pinion-wheel, *p*, begins to turn. As the rack, *r*, is immovable, the pinion-wheel itself works round the rack, thus turning the mill-cap till the sails are again fair and square to the wind. This ingenious arrangement was invented by Andrew Meikle, the farmer-mechanic of Dunbar, in 1760.

The general arrangement of the modern agricultural windmill is shown in fig. 5. The wind-wheel is carried on the top of a light steel structure; sometimes a single mast only is used, being held upright by guys, usually wire ropes secured to the head and to the ground. The 'sails' are vanes, usually of metal, sometimes flat; at others, curved to present the hollows to the wind, and again to present the rounded sides to the wind. Such windmills are built with wind-wheels from 8 feet to 20 feet in diameter, measured over the tips of the vanes, which may be from 16 to 30 in number. A 10-foot mill with a normal wind—that is to say, about 15 miles per hour—will lift a little more than 300 gallons of water per hour to a height of 50 feet, the rate of work of such a mill being thus equivalent to not quite $\frac{1}{12}$th of an effective horse-power. The construction of these mills, the centre of the wind-wheel being largely open, permits them to be kept up to the wind by a simple tail-vane as indicated in the figure.

A problem that has always troubled the builders of windmills of every kind is to maintain some

reasonable regularity of motion in the face of winds of constantly varying strengths. The nature of the problem is clearly indicated in fig. 6, where the thick lines represent horizontal sections of a sail or vane standing upright, the plane in which they are supposed to revolve being marked by the dotted line. The direction of the wind is shown by the full arrows. With the vane in the position *a*, the wind simply tends to overturn it or break it off

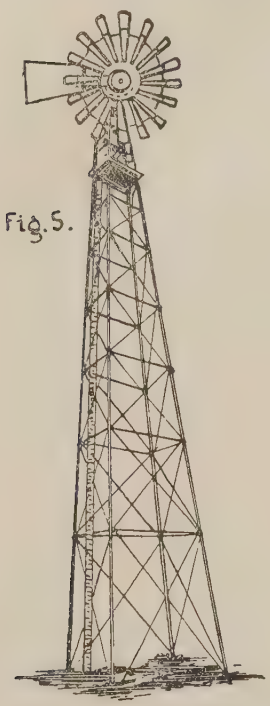


Fig. 5.

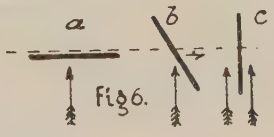


Fig. 6.

from the axle, and does not otherwise tend to produce any motion. Neither does it tend to produce any motion with the vane in the position *c*, edgewise to the wind; but when in the position *b*, the wind tends to push it to the right hand and thus to turn the wheel round. Now the problem is this: When the wind is too light, to turn the vane in the direction of *a*, and thus to present a larger effective surface to the wind; and, when the wind is too strong, to turn the vane more nearly into the position *c*, thus reducing the effective surface exposed to the wind. Many ingenious devices have been designed to attain this end automatically. In the old mills, where the sails were wooden frames covered with fabric, when strong winds were expected a portion of the fabric was removed, to be replaced when lighter winds again blew; a little later the fabric was fixed on rollers, and could be rolled up or let out as required. A further improvement consisted in attaching mechanism to the rollers, which was operated by the mill itself; while, finally, at the beginning of last century, Sir William Cubitt substituted louvre-boards for the sail-fabric, and pivoted the louvres so that they could be turned to present more or less effective surface to the wind. He also held the louvres to a suitable angle by means of a weight in such manner that the wind automatically kept the louvres at the proper angle. This principle is employed to-day in the newer forms of mill, springs, however, taking the place of Cubitt's balance-weights.

It is quite possible that the windmill will one day regain some of the importance as an agent for the development of mechanical power which it has been losing since James Watt's improvements in the steam-engine. Lord Kelvin at one time thought that it might be developed economically in conjunction with the electrical storage battery, and other combinations have been suggested since. At present, however, it occupies a very subordinate place, and is likely to remain in that position for a long time in view of developments in the electrical distribution of energy derived from water-power. To give the windmill a chance it will be necessary, first, to devise simple and not too costly structures which will be strong enough to permit the utilisation of all except the more violent winds; and, secondly, simple and automatic arrangements for storing the power as developed, in order that the wind may be utilised whenever it is available and the power supplied whenever required.

Window (Icel. *vind-auga*, lit. 'wind eye') is an opening in the wall of a building for the admission of light and air. In the East, from time immemorial, windows open not upon the street, but upon an interior court, and are usually provided with lattices or jalousies, or stone and alabaster tracery to exclude the sun's rays. The Chinese use instead of window-glass a thin stuff varnished with shining lac, polished oyster-shells, and thin plates of horn. Among the Romans windows were originally closed with shutters; afterwards they were made of a transparent stone, *lapis specularis*—which from the description can be nothing else than mica—and, in the 2d century after Christ, of horn. According to some there are traces of glass windows having been used in Pompeii; but the matter is doubtful. The first indisputable mention of glass windows is made by Gregory of Tours in the 4th century of our era, who speaks of church windows of coloured glass. St Wilfrid, after succeeding to the bishopric of York in 665, filled the vacant windows of the minster with glass. In 674 Abbot Benedict Biscop brought artists from France to glaze the windows of the abbey of Wearmouth; and the Bishop of Worcester did the same in 726. Leo III., in the end of the 8th century, put glass windows into the church of the Lateran. Glass began to be used in windows of private houses in England as early as 1180, in France in the 14th century. As late as 1458 it struck Æneas Sylvius very much that in Vienna most of the windows were glazed. See GLASS.

In ancient temple architecture windows were unknown—the light being obtained either from the door or from openings in the roof. In Gothic architecture, however, the window is one of the most important features, giving, by the infinite variety of its outline, and the graceful forms of its tracery, as much character and beauty to the Gothic edifices as the columns and colonades of ancient art gave to the classic temples.

In the early Gothic or Norman style the windows were small and comparatively stunted—they were either simple narrow openings with semicircular head, or two such grouped together with a larger arch over both, and decorated with the usual mouldings and ornaments of the style (fig. 1). The inside had generally a wide splay, and simple moulding on the angle. Small circular windows sometimes occur in Norman work.

In the Early English style the windows were elongated, and had pointed arches. They were frequently grouped in twos or threes, and placed

so close together that the wall between became a mullion. The wall space over the group contained within an enclosing arch was then perforated with a quatrefoil or other ornamental opening, and thus the simpler forms of tracery were introduced. The interior arches were splayed off, and were frequently very elaborately decorated with shafts and arch mouldings. The lancet window (so called from its shape) is common in this style. Circular windows are also used with tracery formed by little radiating shafts united by small arches. The triangular window, on a small scale, is also occasionally to be met with.

In the Decorated Style (q.v.) the windows become enlarged and filled with mullions and tracery. This was at first simple, and composed of geometric figures such as the origin and progress of tracery naturally led to. As the style advanced, more flowing forms were introduced, until, in the 15th century, the tracery passed into the Perpendicular (q.v.) style in England, and into the Flamboyant (q.v.) in France. The heads of the lights and the apertures in the tracery are usually foiled (fig. 2), and the inner jambs are splayed and ornamented with mouldings, shafts, &c. In elaborately traceried windows the jamb and arch mouldings are occasionally small, but they are usually bold and deep.

Fig. 1.—Bucknell, Oxford.

In the later Tudor style the window-heads became flattened into the four-centred arch; and in the time of Elizabeth and James I. the arch gave place altogether to the horizontal lintel with the opening divided by mullions into rectangular lights, sometimes foiled at top. Circular or rose windows, with elaborate tracery, are chiefly found in the Decorated period.

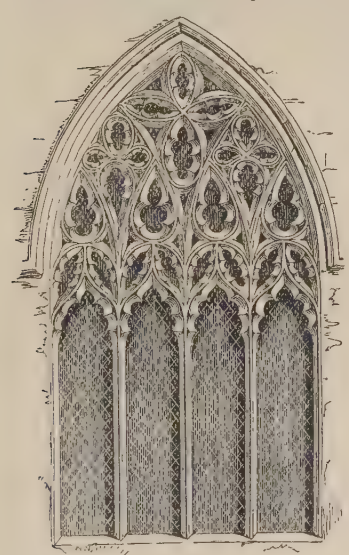


Fig. 2.
Little St Mary, Cambridge, *circa* 1350.

In domestic buildings the windows are similar to the above, but square-headed windows occur more frequently to suit the level line of the floors; and the space between the sill and the floor is recessed and fitted with seats. Transoms are also of common occurrence. The upper part of the window is generally filled with glass fitted into a groove in the stonework, while the lower part is provided with hinged wooden shutters. The Bow or Bay Window (q.v.) is also a frequent and very elegant feature in the later Gothic buildings.

In the revived Classic styles the windows are almost invariably plain rectangular openings, with either a flat lintel or semicircular arch-head. They have sometimes architraves round the jambs and lintel, or are ornamented with pillars supporting an entablature or pediment above. The architraves are frequently carved, and the cornices carried on trusses at each side.

See also the articles Gothic Architecture, Dormer, Glass (Painted), illustrations of many cathedrals (as those of Amiens, Burgos, Notre Dame at Paris, &c.).—The unpopular Window-tax, first imposed in England in 1695, was repeatedly increased between 1784 and 1808, reduced in 1823, and repealed in 1851 (when a tax was laid on inhabited houses instead). The annual amount was latterly over a million and a quarter pounds.

Windpipe. See Larynx, Trachea, Throat, Respiration, Strangulation.

Winds. See Slovenians.

Windsor, a town of Berkshire, on the right bank of the Thames, opposite Eton, 21¼ miles W. by S. of London by rail, 43 by river. The exact meaning of the name is unknown. Its ancient form is *Windleshores*. The kings before the Conquest appear to have had a hunting-lodge here, and Edward the Confessor granted the manor to the abbey of Westminster. Harold, before he assumed the crown, owned the chalk bluff in the parish of Clewer, and after the Conquest the king exchanged Old Windsor with the abbot, but resided occasionally at the new castle which he built in Clewer, to which the name of New Windsor was given. This name was also acquired by the town which grew up round the walls of the castle. In the course of centuries the timber defences, which were probably all that William left on his mound in Clewer, grew into the stately palace we see now. Henry I. resided much here, and married his second queen in the chapel. Henry II. made additions, especially in the Upper Ward, where some remains of Norman architecture have been identified. John was at Windsor after the granting of Magna Charta. Edward III. was born in the castle, where, in later years, he established what is now the oldest order of chivalry. The Black Prince married at Windsor the lady who was called 'the fair maid of Kent,' though she had been twice married and had four children. Froissart mentions the castle where he saw King Edward in mourning for Queen Philippa. David Bruce and James Stewart, kings of Scotland, and John, king of France, were prisoners at Windsor. Henry VI. was born here in 1421. Edward IV. built St George's Chapel, in which, with his predecessor, he lies buried. Henry VII. completed the chapel and built the so-called Tombhouse, part of which is, however, of the time of Henry III., who built it in honour of St Edward the Confessor. Henry VIII. gave the chapel of St Edward to Wolsey, who had a magnificent tomb of black marble made for himself. This was stripped of its ornaments at the Commonwealth, and was finally sent to St Paul's for the funeral of Nelson. Henry VIII. was buried in St George's Chapel, beside Jane Seymour. Queen Elizabeth loved Windsor, and built some chambers which still remain on the north side of the Upper Ward, and are now comprised in the royal library. James I. also was much at Windsor. Charles I. is buried in the grave of Henry VIII. Charles II. employed Wren to build the state apartments. James II. turned Wolsey's Tombhouse into a Roman Catholic chapel, and received the papal nuncio here in July 1687. William III. came to Windsor in the winter of

the following year, on his famous journey from Torbay to London. Queen Anne used to hunt in the park in a chaise, but lived in a small house on the south side of the castle. It was not much affected by George I. or George II., but George III. made it his principal residence, adding considerably to the Queen's House, and also using the state apartments. Madame D'Arblay has amusingly described court life at Windsor. George III. passed his declining years of dotage and blindness in the lower chambers of Queen Elizabeth's building. Queen Charlotte used both the Queen's House and Frogmore; she died in 1818, and in 1823 the Queen's House was pulled down. The royal stables were built on the site in 1839. Meanwhile Wyatville had transformed the castle, under George IV., who came from his lodge in the Great Park to take up his residence in 1828. He died at the castle in 1830, his successor, William IV. in 1837, and the Prince Consort in 1861, all three, by a coincidence, in the same room. Many royal marriages have taken place in St George's Chapel. Prince Leopold, Duke of Albany, is buried in the Wolsey Chapel, which was decorated by Queen Victoria and called by her the Albert Memorial Chapel, the tomb of the Duke of Clarence is in the same place, as is also a cenotaph to the Prince Consort.

As we see it now, Windsor Castle consists of an Upper, Middle, and Lower Ward. In the Upper or eastern Ward are the private apartments, state apartments, library, and corridor. Wyatville

Windsor Castle.

ingeniously connected all the isolated towers and the curtain wall between by means of this corridor, which is 520 feet in length. The state apartments contain many good pictures and other works of art. In the Lower Ward is St George's Chapel, with its cloisters, the Deanery, and the Canons' Houses. The last named contain remains of the palace of Henry III. Adjoining to the westward are the Horseshoe Cloisters, which contain the houses of members of the choir. Next to them are the Guard Room, the Curfew Tower, and the Salisbury Tower. On the south side is the principal gate, built by Henry VIII. In a line with it are the houses of the Military Knights, a band of old officers associated with the Order of the Garter. The Round Tower or Keep is on the ancient mound, from it floats the royal standard. Wyatville lived, till his death in 1840, in the Winchester Tower, called after William of Wykeham. Wyatville made Windsor what it is, and, though we may find fault with his details, his proportions and his eye for a grand scenic effect place him far ahead of any other architect of the so-called Gothic revival.

The town of New Windsor was chartered by Edward I. It contains some interesting old houses, but nothing that can with certainty be dated back to the time of Shakespeare, whose *Merry Wives of Windsor* is said to have been written for Queen Elizabeth. Sir Thomas Fitz designed the town-hall in the market-place, which was finished after his death by Sir C. Wren. The town is pleasantly situated close to the Home Park, and the famous Long Walk, an avenue of elms 3 miles long, which leads to the Great Park. East of the Long Walk is the Royal Mausoleum in which Queen Victoria and the Prince Consort are interred, and the smaller mausoleum in which the Duchess of Kent lies; also Frogmore, the royal gardens, the farm and the dairy. The Great Park contains a church, Cumberland Lodge, and Virginia Water (q.v.), which is nearly 5 miles from the castle. Windsor had two members of parliament till 1867, one till 1918. It now gives its name to the eastern division of Berkshire. Tapestry works founded in 1872 succumbed in 1888. Pop. (1921) 20,115.

See Tighe, *Annals of Windsor* (1848); Hughes, *Windsor Forest* (1890); Loftie, *Windsor Castle* (3d ed. 1891); Sir R. R. Holmes, *Windsor* (1908); the 'Victoria History' of Berkshire; and *Windsor Castle* by Sir W. St John Hope.

Windsor, (1) a town of Nova Scotia at the junction of the Avon and St Croix rivers. The Anglican university of King's College (1788), whose main building was burned in 1920, was removed in 1923 to Halifax. Pop. (1921) 3591.—(2) A city of Ontario, on the Detroit River, opposite Detroit in Michigan, with which it is to be connected by tube. Industries are many and varied. Pop. (1901) 12,153; (1911) 17,819; (1921) 38,591; (1927, estimate) 85,000.

Windsor, the surname assumed, in place of Wettin, by the British royal family in 1917. See GEORGE V.

Windthorst, LUDWIG (1812–91), Catholic politician, was born near Osnabrück, and became distinguished as advocate and politician in Hanover. After the absorption of Hanover by Prussia, he became leader of the Ultramontanes in the German parliament, and chief opponent of Bismarck during the Kulturkampf (see GERMANY, p. 190).

Windward Islands, a group in the West Indies (q.v.) comprising St Lucia (the largest), St Vincent, Barbados, Grenada, and Tobago.

Wine. Wine is the suitably fermented juice of freshly gathered grapes, and wine is also a stimulating, wholesome beverage which has been greatly prized as such among all the more civilised nations ever since the dawn of history. There are countless varieties of wines: wines different in colour and strength, fragrance and flavour, age and price; wines to suit all men and women, be they rich or not, in health or sickness.

Wines vary, in the first place, according to the very variable nature of the grape-juice or 'must' from which they are made. The chemical composition of the must varies according to the species of vines which produce the grapes; the nature of the soil, aspect and climate of the vineyards where the vines are grown; the method of cultivation and the state of the grapes at the time when they are picked and pressed. Wines vary, in the second place, according to the manner and degree of fermentation of the must, and according to the care it receives after fermentation.

I. MUST.—Grape-juice or must is a very complex aqueous solution, composed chiefly of water (80 per cent. or more), grape-sugar (15 per cent. or more), and very minute quantities of a number of other substances of both vegetable (mucilage, gum, &c.) and mineral (sulphates, phosphates, and other salts) origin; the total amount of these substances never reaches 5 per cent. of the total, and yet their influence upon the quality of the wine eventually is considerable. The two most important parts of must, however, are its grape-sugar or $C_6H_{12}O_6$, and the yeasts or Saccharomycetes in it.

Grape-sugar.—Grape-sugar is not a compact entity made up of six atoms of carbon, twelve of hydrogen, and six of oxygen. There is, it is true, that number of atoms in one molecule of grape-sugar, but they are arranged in two distinct groups in the following manner:

Dextrose.		Fructose.
$C_6H_{12}O_6$	+	$C_6H_{12}O_6$

Dextrose and fructose may both be called grape-sugars; their atomic weight is the same:

C_6	=	72
H_2	=	12
O_6	=	96
		180

but their molecular grouping is different:

Dextrose.	Fructose.
CHO	CH_2OH
|	|
CHOH	CO
|	|
CHOH	CHOH
|	|
CHOH	CHOH
|	|
CHOH	CHOH
|	|
CH_2OH	CH_2OH

Small as the difference between these two component parts of grape-sugar may be, it is important from the point of view of fermentation.

Fermentation consists in a series of complex chemical changes, the most important of which causes the transformation of grape-sugars, i.e. dextrose and fructose, into ethyl alcohol and carbon dioxide (carbonic acid gas) according to the following formula:

Grape-sugar.		Alcohol.		Carbon dioxide.
$C_6H_{12}O_6$	=	$2C_2H_6O$	+	$2CO_2$

This change is only possible by the catalytic action of a fermenting enzyme known as zymase, and when there is a sufficient supply of oxygen. This zymase is supplied by Saccharomycetes, which play a very important part in vinous fermentation.

Saccharomycetes.—Saccharomycetes are microscopic fungi. They are generally composed of a single cell, either spherical, elliptical, or cylindrical, formed of a thin cell-wall which contains a granular nitrogenous substance known as protoplasm. These cells grow at the expense of other bodies. When the cell of the Saccharomycetes reaches a certain size—about ten micro-millimetres—it divides itself into two smaller similar cells, which grow and divide themselves again as soon as they have reached their full size. This process goes on so long as the liquid in which they live supplies to the Saccharomycetes sufficient and suitable food; it goes on, however, at a much more rapid rate when the temperature of the liquid is high than when it is low, and it is checked by extremes of heat and cold, by the presence of small quantities of substances such as sulphuric acid, or of too large a proportion of either alcohol or even grape-sugar; it is also checked completely by the total absence of oxygen. The cells of the Saccharomycetes, after they divide or split themselves, either separate altogether, or else remain in group formation, in strings or chaplets closely knit together.

The family of the Saccharomycetes is a large one, but its most illustrious member is *Saccharomyces ellipsoideus*, or ferment of vinous fermentation. The adult cells of *Saccharomyces ellipsoideus* have an elliptical form, and are about 0·00024 by about 0·000176 inches in diameter, with an oval vacuole. When in a liquid, and only if in a liquid containing a certain kind of sugar, each cell of *Saccharomyces ellipsoideus* grows and buds, as all members of the Saccharomycetes family do, dividing itself into two parts, each resembling the mother cell. If the liquid dries up, the protoplasm contained in each cell contracts, and is transformed into one or more spores. These spores may remain undeveloped for a long while, may become perfectly dry, and may even be subjected to considerable heat without losing the power of germination when again placed in conditions favourable to their development.

The Saccharomycetes are the appointed agents of vinous fermentation. Their business is to see that grape-sugar becomes changed into alcohol so that grape-juice may acquire life and become wine. But the Saccharomycetes have enemies, other living micro-organisms like themselves, yeasts, moulds, and bacteria, millions of which are floating in the air, hanging on the cellar walls or cask staves, always ready to pounce upon grape-juice or wine, and start work on their own account. Hence the importance of giving the Saccharomycetes every chance, of having as many of them as possible, studying their likes and dislikes in the matter of temperature and surroundings, and being their true allies in their struggle against the power of their enemies, chiefly the dreaded moulds.

A wet vintage is always dangerous and often disastrous. A wine made of wet-gathered grapes is never safe, not because of the rain-water in the

press, but because of the much smaller number of Saccharomycetes upon the grapes, which means that the vinous fermentation will be slow and therefore unsatisfactory.

A suitable temperature for the immediate growth of the Saccharomycetes is of great importance, since zymase—their enzyme—is indispensable to alcoholic fermentation. But wine is not merely grape-juice with its grape-sugar changed into alcohol and carbon dioxide; in grape-juice there are many other substances besides grape-sugar, and they cannot be expected to remain unaffected by the internal revolution which destroys the chemical structure of grape-sugar and rebuilds with the same materials ethyl alcohol and carbon dioxide. This revolution is the work of alcoholic fermentation, but other fermentations take place at the same time, other vegetable substances which were in the grape-juice are altered, increased, reduced, or may entirely disappear, in ways which differ according to the different enzymes and other catalysts present, as well as according to differences of temperature affecting not only the rate of molecular exchanges, but also the degree of solubility of certain acids.

Temperature is an important factor in fermentation because of the influence it exercises upon the rate of molecular exchanges and upon the solubility of various acids. Grape-juice is so complex, it contains such a large number of various compounds, that any and every variation of temperature is liable to affect some chemical reaction upon which may depend, at a later date, some characteristic of the wine.

Wine.—Wine is a very complex aqueous solution; water and ethyl alcohol form generally about 97 per cent. of its volume, the remaining 3 per cent. being made up of minute quantities of many other substances which are chiefly responsible for the characteristic individuality of every wine. These substances may be classed in two categories, those which were present in the must and have undergone no chemical change during fermentation, and those which were not present in the must and may be considered as by-products of fermentation. In the first category are grape-sugar, Saccharomycetes, some acids, cellulose, essential oils, mucilage, &c.; in the second are glycerine, various acids, alcohols other than ethyl alcohol and volatile esters and aldehydes.

1. Substances, other than Water, which are the same in Must and Wine.—(*a*) *Grape-Sugar.*—The proportion of grape-sugar which remains in wine after fermentation depends, in the first place, upon the proportion of grape-sugar present in the must, and, in the second, upon the process or method of fermentation resorted to. In the case of 'fortified' or 'sweet' wines, whether obtained, like port, by the addition of brandy during fermentation, or, like Sauternes, from over-ripe grapes, the sweeter the must, the sweeter the wine. But, in the case of beverage wines, such as claret, it is often the reverse.

(*b*) *Saccharomycetes.*—Although Saccharomycetes are microscopic fungi, there are millions of them, and they do not escape in air like carbon dioxide. They remain in suspension in the wine until the end of fermentation or until the proportion of alcohol is such that it arrests their growth. They are so fine and so light that they are neither swept down by finings nor do they fall to the bottom of the cask by their own weight; many are carried down into the lees by the microscopic crystals of cream of tartar to which they adhere, many more lose their identity altogether by reason of the chemical splitting up of their cells, and some remain in the wines for all time. There are, of course, a very large variety of Saccharomycetes and allied members of the vast tribe of yeasts, bacteria, and moulds. A form of yeast-fungi which is not unusual in wines is *Mycoderma vini*, or 'flowers of wine.' These micro-organisms multiply very rapidly at the surface of wine and remain on the surface in giant colonies, all holding together and forming a film which can be so complete as to prevent the outside air having any access to the wine. There are quite a number of different species of film-forming microscopic fungi, all of which require much oxygen to grow, and all of which grow with astonishing rapidity.

(*c*) *Acids.*—Generally speaking, the acids which disappear wholly or partly during fermentation are those which are soluble in water and not in alcohol, whilst acids which appear in much larger proportions in wine than in must are those which are formed by the oxidation of ethyl alcohol. Let us take but one example of each class, i.e. tartaric acid and acetic acid.

Tartaric acid is the principal acid in grape-juice. It forms a white crystalline salt which is potassium hydrogen tartrate, commonly known as cream of tartar. Cream of tartar is soluble in water but not in alcohol, and a good deal of the cream of tartar in solution in grape-juice becomes solidified in the shape of fine crystals in the presence of the alcohol of wine; in that form it is heavier than wine, settles in the lees, and is left behind when the wine is racked. Cream of tartar is also more soluble in a warm than in a cold aqueous solution, so that if the new wine be kept in a cold cellar, the lower temperature, together with the alcohol present, will help render a greater proportion of cream of tartar insoluble, thus depriving the wine, after racking, of much acidity present in the must.

An acid must does not necessarily ferment into an acid wine. Acidity in must is of great benefit, because it assists the normal growth of yeasts and checks the development of bacteria, so that it is favourable to alcoholic fermentation. If as well as acidity there is a fair proportion of grape-sugar in the must, this sugar will ferment and be replaced by a fair proportion of alcohol, which, in its turn, will cause the crystallisation of a further proportion of cream of tartar, hitherto in solution. In other words, the more sugar in the must means the more alcohol in the wine and the less cream of tartar. The proof of this is easy to make in Burgundy, where Pinot grapes must and Gamay grapes must from the same district may be compared; the first contains more acidity and more sugar than the second, but when both have become wine, the first contains more alcohol and less acidity than the second.

Acetic acid in wine is due to the oxidation of ethyl alcohol, one atom of oxygen replacing two of hydrogen, thus:

Ethyl Alcohol.	=	CH_3CH_2OH
Acetic Acid.	=	CH_2COOH

The more alcohol there is in a wine and the less oxygen has access to it, the smaller will be the quantity of acetic acid formed. This replacement of two hydrogen atoms by one of oxygen is rendered possible by the presence of an enzyme secreted by the Schizomycetes, and they cannot grow without a free supply of oxygen from the air. Hence when 'flowers of wine' or other film-forming mycoderma cover the surface of wine and prevent all contact with the outside air, no more acetic acid can be formed. On the other hand, wine of a low alcoholic strength kept in a fairly warm place and in contact with the air will soon become vinegar, practically the whole of its ethyl alcohol being changed into acetic acid. Of course, this should be avoided, and it can be avoided with a little care.

At the same time, normal and sound wine is seldom free from acetic acid when new, and, with time, this acetic acid dissolves certain mineral salts in wine, forming various acetates which are partly responsible for the flavour and bouquet of wine.

(*d*) *Cellulose.*—Cellulose is a danger in wine because it may fall a prey to certain bacteria which cause its decomposition into fatty acids and carbonic acid gas, the former being particularly objectionable. Decomposed or 'fermented' cellulose in red wine is the cause of an extremely light viscous sediment, which it is almost impossible to keep out of the decanter and which spoils not only the look but the taste of the wine.

2. Substances, other than Ethyl Alcohol, present in Wine but not in Must.—These substances are numerous and they vary according to the chemical composition of the must, the various enzymes or catalysts present, and the rate and mode of fermentation. They consist chiefly of glycerine and other alcohols, various acids, esters, and aldehydes.

(*a*) *Glycerine.*—Most of the sugar in grape-juice is transformed by fermentation into ethyl alcohol and carbon dioxide, but not the whole of it. Pasteur's experiments, which more recent researches have completely confirmed, showed that alcoholic fermentation could not use up more than 95 per cent. of the sugar present in grape-juice in the proportion of about 48 per cent. ethyl alcohol and 47 carbon dioxide. The remaining 5 per cent. of sugar is used up in other ways; a small quantity being used by Saccharomycetes themselves by way of food or means of cellular development; a small percentage being decomposed into minute quantities of various volatile acids, and the greater proportion being used up in the production of glycerine.

(*b*) *Other Alcohols.*—Besides glycerine which, after and a long way behind ethyl alcohol, is the most important by-product of vinous fermentation, there are other alcohols in wine. Such are propyl and butyl alcohols, practically in all cases, and amyl alcohol sometimes. Although these and other alcohols are present in normal wines only in minute quantities, they have, like all alcohols, the property of forming esters with acids, and they play quite an important part, compared to their volume, in the formation of the bouquet or aroma of wine.

(*c*) *Acids.*—Some of the acidity in the must, particularly in the shape of cream of tartar, disappears during fermentation, but on the other hand, there are some acids which were not in the must and which are normally present in the wine as by-products of fermentation. First among these is succinic acid, which is the principal cause of the 'winy' flavour of wine, its 'saveur'; the proportion of succinic acid in a wine, according to Pasteur, is 0·61 per cent. of the grape-sugar in the must. A very small quantity of grape-sugar is also transformed, during fermentation, into acetic acid, propionic acid and traces of valerianic acid. These acids are present in very small quantities, and they do not affect the taste of wine, but they are responsible to a certain extent for its bouquet; the esters, which give to a wine its bouquet, being formed by alcohols at the expense of acids. Normal wine, that is wine which is sound and suitably fermented, contains always a little acetic acid, but it is only very little. When acetic acid is present in wine in a noticeable amount, it is not the result of the decomposition of grape-sugar, but of the oxidation of ethyl alcohol; it is a sure sign that the wine is not absolutely sound, that it will soon be vinegar, and no longer wine, if the progress of acetification is not promptly checked.

The variety of volatile and non-volatile acids in wine, which differ from those of the must, is very great, and Prior's researches have proved that the differences existing in the acids of different wines are due to the differences existing in the species of Saccharomycetes and other micro-organisms present in the must or introduced into the wine at a later date. In every case those acids are present only in minute quantities, sometimes there are but traces of each, but the importance of the part they play upon the degree of excellence of a wine is out of all proportion to their volume.

(*d*) *Aldehydes.*—Aldehydes are always present in wine. They may be regarded as by-products of alcoholic fermentation and as intermediary organic compounds between alcohols and acids. They must eventually become either acids by the action of oxidizing agents, or else alcohols by the intervention of reducing agents.

(*e*) *Esters.*—The ethyl formates, acetates, propionates, butyrates, lactates, and other such esters are due to reactions between alcohols and acetic acid, propionic acid, butyric acid, lactic acid, &c. They are volatile and give to wines their distinctive aroma.

Varieties of Wines.—Wines may be classed in three main categories: (*a*) Beverage Wines; (*b*) Sparkling Wines; (*c*) Fortified Wines. Beverage wines, sparkling wines, and fortified wines may be made from any and every kind of grapes; it is only a matter of (*a*) letting the must ferment right out in casks or vats so that the carbonic acid gas generated loses itself in the air in the case of beverage wines; or (*b*) letting the fermentation take place partly in bottle so that the generated carbon dioxide is unable to escape and remains in solution in the wine; or (*c*) checking the fermentation at an early or later stage so that the wine retains some of its original grape-sugar unfermented.

In each one of these three classes there are ever so many different varieties of wines owing to the differences existing in the chemical composition of the must and the differences in the number and nature of the Saccharomycetes present at the vintage or pressing of the grapes. Moreover, although, theoretically, beverage wines, sparkling wines, and fortified wines may be made of all and every sort of grapes, it is only when made of suitable grapes that they are acceptable.

(*a*) *Beverage Wines.*—The bulk of the wines which every year are made throughout the civilised world are beverage wines, black, red, pink, gray, green, golden wines, mostly common and cheap wines without any particular charm as regards taste and fragrance, but wholesome because they are free from all germs such as will live and thrive in water or milk, and also because they contain a little ethyl alcohol (8 to 12 per cent. by weight) which has a gentle stimulating influence upon the salivary glands and the digestive organs, as well as some acids which have beneficial effects upon bladder and kidneys. Such wines are usually at their best when quite young. They generally contain either an excess or a lack of acids which causes them to grow rapidly either vapid or sharp with age. But there are other naturally and thoroughly fermented wines which possess in exactly the right proportions the right kinds of acids, sugar, and alcohol; they are so well balanced, so harmoniously built, that the older they are the greater and finer will be the volatile ethers which they will develop, provided, of course, that they are properly kept and cared for, away from light, air, and extremes of heat or cold. Such wines are made only in a few favoured wine-growing districts of the world where the art of wine-making has

been practised for many centuries and has attained to a very high degree of perfection; they nearly all come from Bordeaux and Burgundy as regards the red wines, and from the Rhine and Moselle valleys for white wines.

(*b*) *Sparkling Wines.*—Sparkling wines are wines which are rendered sparkling by one of two methods, the right one or the wrong one. The wrong one consists in pumping gas into any wine, and the right one is to bottle the wine when it still contains sugar which will ferment and active Saccharomycetes which will ensure proper fermentation within the bottle. The carbon dioxide generated by fermentation being unable to escape remains in solution in the wine; it can only escape when the cork is drawn and the wine poured out, and it is the escape of this carbonic acid gas in solution in the wine which causes the wine to be 'bubbly.' The presence of carbonic acid gas in a wine may be, and usually is, objectionable; it is only in the case of the lightest, flimsiest of wines, wines of great delicacy, that this carbonic acid gas is not only acceptable but greatly desirable. Sparkling wines are made in all wine-producing countries, but no sparkling wine has ever approached in excellence sparkling champagne, the prototype of all sparkling wines.

(*c*) *Fortified Wines.*—As all wines may be rendered sparkling, so all may be fortified, but not all are suitable. Generally speaking, the wines made in Spain, Portugal, and Madeira, and also in Australia and South Africa, possess a greater proportion of natural grape-sugar, but, when left alone to ferment right out, they lose it all, and are harsher than wines made in more temperate districts. On the other hand, these naturally rich-in-sugar wines are the only ones which are suitable for making fortified wines by the addition of brandy, which checks fermentation and allows them to retain some of their original grape-sugar. The finest fortified wine is port wine, made of a good vintage and matured a sufficiently long time to attain perfection. Sherry is also a very fine fortified wine of which there exist ever so many different varieties, but whilst the fermentation of port is checked at the time of the vintage, when the grapes are crushed, sherry is allowed to ferment naturally until it has become wine before brandy is added to it.

World's Production of Wine.—According to the statistics published in 1927 by the Rome International Statistical Bureau, the principal wine-producing countries of Europe (not including Russia) and of the British Empire were as follows:

Countries of Origin.	Total Production (1925) Gallons.	Imports in Great Britain (1926) Gallons.
France	1,380,875,826	3,543,359
Italy	998,074,000	651,396
Spain	587,347,024	3,490,419
Portugal	121,575,476	7,839,629
Rumania	93,421,328	—
Serbia	90,143,064	—
Hungary	78,969,506	—
Greece	41,785,744	—
Germany	35,000,702	282,302
Bulgaria	32,230,000	—
Austria	18,922,508	—
Switzerland	12,100,000	—
Czechoslovakia	6,888,618	—
Luxemburg	466,642	—
Australia	14,665,508	1,755,527
South Africa	7,500,372	118,342
Cyprus	2,977,398	—
Malta	718,278	—
		(all others) 182,219

Consumption of Wine in England.—The statistics collected by the Board of Trade relating to the import of wines in the United Kingdom during the calendar years 1924, 1925, and 1926 are as follows:

Countries whence imported.	1924. Gallons.	1925. Gallons.	1925. Gallons.
France	3,195,260	3,184,438	3,543,359
Portugal	9,302,901	8,500,811	7,839,629
Spain { Red	1,894,040	2,272,836	2,041,790
Spain { White	1,274,084	1,370,191	1,448,982
Germany	206,046	306,030	282,302
Madeira	48,239	54,475	67,463
Italy	542,291	679,208	651,396
Other foreign countries	82,562	104,290	87,544
Total foreign countries	16,545,423	16,472,979	15,962,465
British South Africa	104,419	61,521	118,342
Australia	823,982	1,028,464	1,755,527
Other British possessions	177,035	204,329	182,219
Total British possessions	1,105,436	1,294,314	2,056,088
Total of wines in casks and in bottles	17,650,859	17,767,293	18,018,553
Wines in bottles, sparkling:			
Champagne	845,559	846,743	963,454
Saumur	52,786	54,159	41,129
Burgundy	26,818	24,752	23,400
Hock	8,997	8,374	9,416
Moselle	27,610	24,400	24,079
Other sorts	146,737	129,293	158,414
Total of sparkling wines in bottles	1,108,507	1,087,721	1,219,892

The Taxation of Wine.—Customs duties are charged upon all wines imported into Great Britain according to (*a*) their alcoholic strength and (*b*) their country of origin, whether within or without the British Empire.

Duties upon wine imported into Great Britain were fixed by the Finance Act, 1927, as follows:

As regards foreign wines:

DESCRIPTION OF WINE—Part I.	Rate of Duty per Gallon. s.	d.
Not exceeding twenty-five degrees proof spirit	3	0
Exceeding twenty-five degrees and not exceeding forty-two degrees	8	0
Every degree or fraction of a degree above forty-two degrees, an additional duty	0	8
Sparkling, an additional duty	12	6
Still, in bottle, an additional duty	2	0

As regards Empire products:

DESCRIPTION OF WINE—Part II.		
Not exceeding twenty-seven degrees proof spirit	2	0
Exceeding twenty-seven degrees and not exceeding forty-two degrees	4	0
Every degree or fraction of a degree above forty-two degrees, an additional duty	0	4
Sparkling, an additional duty	6	3
Still, in bottle, an additional duty	1	0

Description and Cost of Wines.—The following table supplies a fair index of the retail prices of the more popular wines obtainable from most retail wine merchants in England:

A. BEVERAGE WINES.

1. Red wines—
   - Claret, from 2s. to 15s. per bottle.
   - Burgundy, from 3s. to 20s. per bottle.
   - Italian and Spanish red wines, from 1s. 6d. to 3s. per bottle.
2. White wines—
   - Hocks and Moselles, from 3s. to 20s. per bottle.
   - Graves, from 2s. to 4s. per bottle.
   - Sauternes, from 4s. to 15s. per bottle.
   - Burgundy, from 3s. to 15s. per bottle.

B. SPARKLING WINES.

- Champagne, from 12s. to 25s. per bottle.
- Saumur, from 7s. to 10s. per bottle.
- Hocks and Moselles, from 6s. to 9s. per bottle.

C. FORTIFIED or DESSERT WINES.

- Port, from 3s. 6d. to 25s. per bottle.
- Sherry, from 3s. to 15s. per bottle.
- Madeira, from 4s. to 12s. per bottle.
- Marsala, from 3s. to 6s. per bottle.
- Australian and South African, from 2s. 6d. to 5s. per bottle.

Bibliography.—André L. Simon, *History of the Champagne Trade in England* (1905); André L. Simon, *History of the Wine Trade in England:* Vol. I. *In*

earliest Times to the Fourteenth Century (1906), Vol. II., *Fifteenth and Sixteenth Centuries* (1907), Vol. III., *Seventeenth Century* (1909); E. R. Emerson, *Beverages Past and Present* (2 vols. 1908); W. H. R. Rivers, *The Influence of Alcohol on Fatigue* (1908); A. Harden, *Alcoholic Fermentation* (3d edition, 1923); J. A. Murray, *Beverages* (1912); André L. Simon, *In Vino Veritas: A Book about Wine* (1913); André L. Simon, *Wine and Spirits: The Connoisseur's Text-book* (1919); André L. Simon, *The Blood of the Grape: The Wine Trade Text-book* (1920); Prof. George Saintsbury, *Notes on a Cellar Book* (1920); *Clarets and Sauternes* (*Wine and Spirit Trade Record*, 1920); André L. Simon, *Wine and the Wine Trade* (1921); W. J. Todd, *A Handbook on Wine* (1922); Prof. E. H. Starling, *The Action of Alcohol on Man* (1923); André L. Simon, *The Supply, the Care, and the Sale of Wine: A Book of reference for Wine-merchants* (1923); Wm. Bird, *French Wines* (1924); H. Warner Allen, *The Wines of France* (1924); *Through the Wine List*, by 'Diner Out' (A. E. Manning Foster) (1924); G. Tait, *Practical Handbook on Port Wine* (1926); W. J. Todd, *Port* (1926); Len Chaloner, *What the Vintners Sell* (1926); Frank Hedges Butler, *Wine and the Wine Lands of the World* (1926); André L. Simon, *Bottlescrew Days: Wine-drinking in England during the Eighteenth Century* (1926); André L. Simon, *Bibliotheca Bacchica* (Vol. I.) *Incunables* (1927).

Winer, Georg Benedikt, a great New Testament scholar, was born at Leipzig, 13th April 1789, studied there, and in due time became *privat-docent* and professor extra-ordinary in Theology. He was called to a chair at Erlangen in 1823, but returned as ordinary professor to Leipzig in 1832, and died there, 12th March 1858. Of his numerous works first in importance stands his invaluable and still unequalled *Grammatik des neutestamentlichen Sprachidioms* (1821; 8th ed. by Schmiedel, 1895). No less admirable are his *Biblisches Realwörterbuch* (1820; 3d ed. 2 vols. 1847–48), a storehouse of sound learning and sagacity, and the invaluable *Handbuch der theologischen Literatur* (1821; 3d ed. 2 vols. 1838–40; supplement, 1842).

Winfield, capital of Cowley county, Kansas, on Whitewater Creek, 247 miles by rail SW. of Kansas City; pop. (1920) 7933.

Wingate, Sir James Lawton, Scottish landscape painter, born at Kelvinhaugh near Glasgow in 1846, the son of a chemist, spent some unwilling years in a merchant's office before resigning himself wholly to art. He studied his subject in Italy and Edinburgh, and became noted for his landscapes, for whose inspiration he was content never to stray far from Edinburgh or the Clyde estuary. Living a retired life, first near Crieff then in Edinburgh, he added quietly but surely to his fame and became president of the Royal Scottish Academy in 1919. He was knighted in 1920 and died in Edinburgh, 22d April 1924.

Wings. See Birds, Flight of Animals.

Winifred, St, according to the legend, was a noble British maiden, whose head the prince Caradog cut off because she repelled his unholy proposals. The head rolled down a hill, and where it stopped a spring gushed forth—famous after as a place of pilgrimage, Holywell in Flintshire (see Wells). The saint's head was replaced by St Beuno, and St Winifred survived the miracle fifteen years.—For Winfried, see Boniface.

Winkelried, Arnold von. See Sempach.

Winnebago. See Wisconsin.

Winnipeg, the third city of Canada and capital of the province of Manitoba, stands at the confluence of the Assiniboine with the Red River, by rail 1424 miles WNW. of Montreal, and 60 miles N. of the U.S. boundary. Formerly known as Fort Garry, from the Hudson's Bay Company's post so called (pop. in 1871, 241), it was incorporated as the city of Winnipeg in 1873. Since that date its development has been extremely rapid, and it is now the chief commercial, financial, and railway centre of western Canada. It is substantially built of stone and brick, with wide, well-arranged streets and handsome parks. Abundant power resources are available on the Winnipeg River, some 75 miles distant, and are used to the fullest advantage in the city's hydro-electric (1911) and central-heating (1924) plants. Electricity, being very cheap, is extensively employed. Winnipeg is the chief railway centre of the west; it has many railroad yards, shops, &c., and from it lines radiate in almost thirty directions. By means of a system of locks on the Red River, ships of some size can reach the city from Lake Winnipeg. Its position makes it the headquarters of the agricultural (especially grain) trade of the immense fertile prairie region of the western provinces, and it has great grain-elevators and flour-mills, whilst manufacturing interests are increasing in number and variety. The principal buildings are the government offices, city hall, post-office, numerous churches, a fine hospital, the buildings of the university of Manitoba (founded 1877; a provincial university since 1917), and a large number of elegantly built public schools. Pop. (1871) 241; (1891) 25,642; (1901) 42,340; (1921) 179,087. St Boniface, situated on the opposite side of the river, is a Roman Catholic centre, with a cathedral, a convent, and a college. It is a distinct municipality. Pop. (1921) 12,816.

Winnipeg, Lake, in Manitoba, 40 miles N. of Winnipeg city, and 650 feet above sea-level, is 280 miles long, 57 miles broad, and has an area of 9500 sq. m. It is shallow and well stocked with fish. Its largest tributaries are the Saskatchewan (q.v.), the Winnipeg, and the Red River of the North (q.v.); its outlet is the Nelson River (q.v.). The Winnipeg River flows from the Lake of the Woods in a tortuous course NW. to Lake Winnipeg.

Winnipegosis, Lake (area 2086 sq. m.), lies to the west of Lake Winnipeg.

Winona, in Minnesota, on the right bank of the Mississippi (here crossed by several bridges), 103 miles SE. of St Paul, with a state normal school, flour and saw mills, foundries, carriage, barrel, and door factories, &c.; pop. (1920) 19,143.

Winsford, a town of Cheshire, 6 miles S. of Northwich, with salt-works; pop. 11,000.

Winslow, Edward, was born in 1595 at Droitwich, sailed in the *Mayflower*, was from 1624 assistant-governor, and for three short periods governor, of Plymouth colony, Massachusetts, and published *Good Newes from New England* (1624), *Hypocrisie Unmasked* (1646), and *New England's Salamander* (1647), three valuable accounts of the young colony.—His son, Josiah (1629–80), was assistant-governor from 1657 to 1673, and then governor till his death.—His grandson, John (1702–74), carried out, under orders, the removal of the Acadians (see Acadia); and John Ancrum Winslow (1811–73), descendant of one of Edward Winslow's brothers, commanded the *Kearsarge* in her action with the *Alabama* (q.v.), and died an admiral.

Winsor, Justin, born at Boston, Massachusetts, in 1831, was librarian at Boston and at Harvard, and edited the *Memorial History of Boston* (4 vols. 1880–81) and *The Narrative and Critical History of America* (8 vols. 1884–90). In 1891 he issued a Life of Columbus. He died 22d October 1897.

Winston-Salem, the greatest city of North Carolina, 218 miles SW. of Richmond in Virginia, with very extensive tobacco-factories, and manufactories of textiles, tires, wagons, &c. Pop. (1920) 48,395.

Wint, PETER DE, water-colourist, was born at Stone, Staffordshire, 21st January 1784, the son of a physician, sprung from a Dutch family settled in New York. He was trained to be a mezzotint engraver under J. R. Smith, but soon took to painting both in oil and water-colours, and his fame rests on his beautiful water-colour illustrations of English landscape, English architecture, and English country-life. Lincoln (where he found a wife), Yorkshire, and parts of Derbyshire were the regions he loved best; but he painted scenes on the Thames, the Trent, and in Wales and elsewhere. He exhibited mainly in the rooms of the Old Water-colour Society, and is well represented both in the National Gallery and at South Kensington. He died at London (where he had mostly lived), 30th June 1849. Among his most famous pictures are 'The Cricketers,' 'Lincoln Cathedral,' 'The Hay Harvest,' 'Nottingham,' 'Richmond Hill,' 'Cows in Water.' 'A Cornfield' and 'A Woody Landscape' are oils at South Kensington.

See the Memoir by Walter Armstrong (1888), and Redgrave's *David Cox and Peter de Wint* in the 'Great Artists' (1891).

Winter. See SEASONS, EARTH.

Winterberry, a name given to several shrubs of the genus Ilex, growing in the eastern parts of North America. *I. verticillata*, the Virginian Winterberry, has white flowers in clusters, and bright scarlet berries that remain after the fall of the leaf. The bark is astringent and tonic.

Winter-cherry, *Physalis Alkekengi*, one of the Solanaceæ, with edible red berries, also called in the United States Strawberry-tomatoes. *P. peruviana*, or Peruvian Gooseberry (see CAPE GOOSEBERRY), has yellow berries. The name is given, too, in the United States to the tropical *Cardiospermum Halicacabum*, also called Balloon Vine, from the large, triangular, inflated fruit.

Wintergreen. See GAULTHERIA. The oil of wintergreen, named from this plant, is an aromatic stimulant, used chiefly in flavouring confectionery and syrups; and is now obtained from the sweet birch as frequently as from the wintergreen plant. The name is also given to plants of the genera Pyrola and Chimophila, herbaceous or half-shrubby plants. The species of Pyrola are found throughout the northern hemisphere, several being natives of Britain; the species of Chimophila, found in North America, are sometimes distinguished as spotted wintergreen. Both *Gaultheria procumbens* and a low-climbing plant, *Mitchella repens* (Rubiaceæ; found also in Japan), are called Checkerberry in the United States. Chickweed-wintergreen is *Trientalis europæa*, a plant of the Primulaceæ, found in the north of England and the Scottish Highlands. From its rhizome it sends up a short stem with a tuft of leaves near the top, and a white flower, its parts commonly in sevens.

Winter's Bark, a stimulant, aromatic, and tonic bark, named from Captain Winter, who first brought it from the Strait of Magellan in 1579. It is the produce of *Drimys Winteri*, a native of some of the mountainous parts of South America, and abundant in the lower grounds of Cape Horn and Staten Island—a magnoliaceous evergreen shrub with laurel-like leaves and corymbs of white flowers. The Star Anise (Illicium) is nearly allied to it. The bark of other species of Drimys has properties similar to those of Winter's bark, as that of *D. axillaris*, a New Zealand tree.

Winterthur, a town and railway junction of Switzerland, on the Eulach, 17 miles by rail NE. of Zürich, with thriving manufactures of locomotives, textiles, &c. It contains a good town-hall, industrial schools, a museum of Roman antiquities, and a public library. Pop. (1920) 49,969. The Roman *Vitodurum* (now Ober-Winterthur), it was held by the Counts of Kyburg (castle 4 miles off), and then by the Hapsburgs, who sold it to Zürich in 1467.

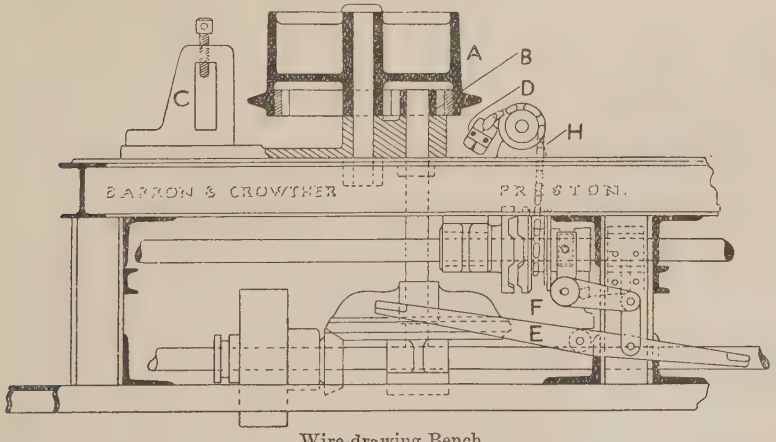
Winthrop Family.—JOHN, governor of the colony of Massachusetts, was born at Groton, near Hadleigh, in Suffolk, England, January 22, 1588, was bred to the law, appointed justice of peace at the age of eighteen, and on account of his excellent and pious character was in 1629 elected by the governor and company of Massachusetts Bay to govern their colony. He landed at Salem, with the colony's charter and a fleet of eleven ships, on June 22, 1630. He was re-elected governor every year until 1634. In 1636 he became deputy-governor under Sir Harry Vane, with whom he had an animated controversy on the doctrines of Mrs Hutchinson. In 1637 he was elected over Sir Harry, and continued governor, with a brief interval, during his life, and had more influence probably than any other man in forming the political institutions of the northern states of America. He died at Boston, March 26, 1649. Winthrop kept a careful journal, the first part of which was published in 1790, and the whole in 1825–26 (new ed. with additions, 1853). See his *Life and Letters*, by R. C. Winthrop (Bost. 1864–67).—JOHN, governor of Connecticut, eldest son of the preceding, was born at Groton, England, February 12, 1606; educated at Trinity College, Dublin; made the tour of Europe; went to America in 1631, and was chosen a magistrate in Massachusetts; in 1635 went to Connecticut and built a fort at the mouth of the Connecticut River, being governor of the colony for a year; and founded the city of New London in 1646, settling there in 1650. In 1657 he was elected governor, and, with the exception of one year, held that post till his death. He obtained from Charles II. a charter which united the colonies of Connecticut and New Haven, and was named first governor under it; and he was the father of the paper currency in America. He was a student and a scholar, a fellow of the Royal Society, a Puritan without bigotry, and just and even lenient to those of other religious opinions. He died at Boston, April 5, 1676.—His son, also JOHN, but known as Fitz-John (1639–1707), served under Monk and in the Indian wars, was agent in London for Connecticut (1693–97), and governor of the colony from 1698 till his death. See the *Winthrop Papers* (Mass. Hist. Soc., 1889).—JOHN, LL.D., American physicist, a descendant of the first Governor Winthrop, was born at Boston in 1714, graduated at Harvard in 1732, and in 1738 was appointed professor of Mathematics and Natural Philosophy there. In 1740 he observed the transit of Mercury, and in 1761 he went to Newfoundland to observe the second transit in the century. He published papers on earthquakes, comets, and other subjects, was a fellow of the Royal Society, and died May 3, 1779.—ROBERT CHARLES, LL.D., American orator, descendant of the sixth generation from the first Governor Winthrop, was born at Boston, May 12, 1809, graduated at Harvard in 1828, studied law with Daniel Webster, was admitted to the bar, and sat in the state legislature in 1834–40. A member of congress for ten years, he was in 1847–49 its speaker. In 1850–51 senator from Massachusetts, he just missed the post of governor. He wrote a Life of the first John Winthrop and other biographies, and died in 1894. See his *Addresses and Speeches*, and the Life of him by his son (1897).—THEODORE (1828–61), a descendant of the second John, was born at New Haven, studied at Yale, was successively barrister, surveyor, and volunteer, falling in the civil war. His novels, *Cecil Dreeme*, a romance of New York; *John Brent*,

instinct with the glamour of the Wild West; and *Edwin Brothertoft*, a story of the Revolutionary war, were issued posthumously.

Winzet, NINIAN, was born at Renfrew in 1518. It is probable that he was educated at the university of Glasgow; and he was certainly ordained priest in 1540. About 1552 he was appointed master of the grammar-school at Linlithgow, where he also acted as a notary, and was eventually promoted to the provostry of the Collegiate Church of St Michael's. On the establishment of Protestantism in Scotland (1560) Winzet, who adhered to the old religion, was deprived of his various offices, and came to Edinburgh, where he received the countenance of Queen Mary. It was now that he wrote his pamphlets entitled *Certane Tractatis for Reformatioun of Doctryne and Maneris*, which have given him an honourable place among Scottish Catholics posterior to the Reformation. Forced to quit Scotland in 1563, he made his home in the university of Paris till 1571, when he was summoned to England to perform certain services to Mary who was now in captivity. Returning to Paris the same year, he became a teacher of some distinction in the university, holding thrice in succession the office of Procurator of the German Nation. In 1574 he removed to the English College of Douai, where he became licentiate in theology, and in 1577 his learning and various services to the church were rewarded by his appointment as Abbot of St James's, Ratisbon. In this office, which he discharged with characteristic energy and fidelity, he died in 1592.

See Irving, *Lives of Scotish Writers*, and Winzet's Works (1891), edited for the Scottish Text Society by the Rev. J. K. Hewison. Winzet should rather be spelt Winyet (=Wingate), *z* being really yogh, pronounced *y* in old Scots.

Wire. Specimens of wires in gold, silver, and copper, from Babylonia have been shown in the British Museum which on the authority of the excavator date from 3500 B.C. Wire from Egyptian sources of about 800 B.C. is also known. This wire was probably cut in strips from hammered plates and rounded for use. The art of wire-drawing was not practised until the 14th century, or introduced into Great Britain till some three centuries later. The facility with which any metal can be drawn into wire depends upon its ductility. Most metals possess this property; though some, like bismuth and antimony, are so brittle that they can only be drawn out with difficulty, and wire made from such metals is useless from want of tenacity. The general principle involved in the manufacture of wire consists in rolling down ingots or bars into rods of say ¼ or ⅛ inch diameter, which are afterwards attenuated and reduced in section by being drawn cold through holes in metal plates or diamonds or other hard stones. The accompanying illustration shows a wire-drawing bench. The 'block' or drum A is driven by the pinion B acting upon an internal toothed ring, and in rotating draws the wire through the draw-plate, which is carried by the bracket C. To commence a new coil the end of the wire rod is reduced and pushed through the draw-plate, where it is caught by the grip D.



Wire-drawing Bench.

By depressing the pedal E the clutch F pulls the chain H across, and a sufficient length of wire is thus obtained to wrap round the drum to the point near the top (not shown) where it is fastened. The wire is pulled on to the drum close to the lower flange and, by reason of it being slightly coned, all but the lower coils ride up loosely upon the drum. The draw-plate or 'wortle' plate is usually made of hard cast-steel or chilled cast-iron, and has several holes all of the same size. The holes are enlarged where the wire enters and then reduced to a short tapering portion near the face of the plate in which the actual drawing down takes place, the diameter of the small end of this part determining the 'gauge' or size of the wire produced. After a certain length of wire has been drawn—depending upon the material of wire and die and the speed of drawing—the hole becomes slightly worn, and a new hole must be brought into use. Although very hard, the metal round the worn hole may be 'battered' up by hand or machine and again reamered out and finished to size once or twice, thus increasing the life of the draw-plate for the size of wire concerned. Sometimes the hole is finished by the use of a carefully-prepared hard steel punch of very accurate shape, which is driven in from the back to determine the final form of the critical part of the drawing hole. For small sizes, and special work, a button die with one hole may be used in a special holder, or a drilled diamond or other hard stone may be encased in such a button and supported and used in the same way. Formerly the wire-drawer was a skilled mechanic who prepared and kept in order his own draw plates, but there is a tendency to follow American practice and regard the actual drawing as a semi-skilled craft, the drawplates being prepared by skilled workmen for issue to the drawer as required. Iron and steel wire rod coiled into a bundle is first pickled to remove the mill scale and 'banged' to remove adherent matter, after which a coating of ferric hydrate is produced upon the surface of the bundle by keeping it moist in air by a spray of water; this coating ('browning') is important in easing the passage of the wire through the dies, while to neutralise any free acid the coils are afterwards dipped in boiling lime water and baked, to prevent brittleness. The lime coating protects the browning and prevents further chemical action.

The reduction in the sectional area at each 'pass' varies, but in a particular case of about seven or

eight passes the first reductions were 17 per cent. of the area, proceeding to 20 per cent. and to 30 per cent., but in the two final passes the reduction called for was less. The process of reduction hardens most materials and it becomes necessary to anneal the 'bundle' at intervals, the resultant oxide having to be removed before the next drawing takes place. Sometimes the coil is annealed by heating in the presence of an inert gas which leaves the bundle quite bright and clean.

Further to assist the passage of the wire through the die certain proprietary lubricants may be used, or soap powder, or, for wet-drawing, stale beer or other mixtures.

The tensile strength of the material is greatly increased by drawing, so that, for example, a rod of 0·75 per cent. carbon steel, having when annealed a tensile strength of about 47 tons per square inch, was reduced in about seventeen to twenty passes, with intermediate annealings, to a wire having a tensile strength of 150 to 160 tons per square inch.

The speed of drawing depends upon the material and the fineness of the wire, for example, gauges 5 to 20 S.W.G. can be drawn at 250 to 500 feet per minute. Fine copper wire in a 'continuous' machine with two or more drawings may reach 900 feet per minute.

Music steel wire can be commercially drawn to ·005 inch diameter, mild steel to ·0025, while copper may be attenuated to ·001 inch, and pure iron to ·002. Platinum makes the finest wire of ·00003 inch diameter, but for drawing down to such fineness it must be encased in some other metal such as silver, and drawn with it so as to retain workable dimensions, the silver being afterwards dissolved away. At the British Empire Exhibition in 1924 a coil of copper wire $\frac{1}{8}$ inch diameter was shown having a length of $7\frac{1}{2}$ miles without a joint and weighing 2120 lbs., also a coil of No. 47 gauge containing 20 miles of wire weighing $16\frac{1}{2}$ ozs.

Wires of circular or special shaped sections may also be made by the extrusion method in which the metal or alloy is forced at a particular temperature by mechanical pressure through a die which gives it the desired form. The method is mostly used for non-ferrous alloys and very complicated sections can be produced.

The table below gives a comparison of the wire gauges now in use. Formerly much confusion arose from the multiplicity of gauge tables, but in 1884 the *Imperial Standard wire gauge* was legalised, and was intended to be used for all wires, sheets, and hoops which could be measured by a fixed gauge, but the Staffordshire manufacturers objected to any departures from their ancient gauges, and only after protracted negotiation was a compromise reached in 1914, when it was agreed to retain the Birmingham gauge (B.G. not B.W.G.) for iron and steel sheets and hoops, leaving the Imperial Standard for wires and the like. Finality has not yet been reached, but the matter is simplified by the growing tendency to supplement the gauge size by the measurement in 'mils' where 1 mil = $\frac{1}{1000}$ inch. Silver and gold have a special wire gauge running from 1 = ·004 inch to 36 = ·167 inch. Sheet zinc is sold by a *trade gauge* running from 1 = ·00395 to 26 = ·1052, as well as by B.G. and 'mils.'

The production of wire is a staple industry in all the steel making countries, and rose to an enormous tonnage during the Great War for special purposes. Its ordinary uses comprise, beside wire ropes, electric wires, telephone, telegraph, submarine cables, wireless and aerial wires, coils for instruments, resistance and filament wires, weaving wires for cloth or gauze, pins, ornaments and domestic articles, jewellery, braid, music and embroidery, springs, carding wires, barbed and fencing wires.

WIRE-ROPES seem to have originated in Germany about 1821, and in the suspension bridge at Geneva, built in 1822, ropes of parallel and untwisted wire, bound together on the 'selvagee' method, were employed. Some fifteen years later 'formed' or 'stranded' wire-ropes were manufactured and

COMPARATIVE TABLE OF WIRE GAUGES.

Gauge Number.	Imperial Standard (S.W.G.) Wire Gauge.	Birmingham (B.W.G.) or Stubs Iron Wire Gauge.	Stubs Steel Wire Gauge.	American (A.W.G.) or Brown & Sharpe Wire Gauge.
7/0	·500	..	The largest size is	..
6/0	·464	..	'Z' = ·413. The	..
5/0	·432	..	Gauge Letters run	..
0000	·400	·454	backward through	·460
000	·372	·425	the Alphabet to	·40964
00	·348	·380	A = ·234.	·3648
0	·324	·340		·32486
1	·300	·300	·227	·2893
2	·276	·284	·219	·25763
3	·252	·259	·212	·22942
4	·232	·238	·207	·20431
5	·212	·220	·204	·18194
6	·192	·203	·201	·16202
7	·176	·180	·199	·14428
8	·160	·165	·197	·12849
9	·144	·148	·194	·11443
10	·128	·134	·191	·10189
11	·116	·120	·188	·090742
12	·104	·109	·185	·080808
13	·092	·095	·182	·071961
14	·080	·083	·180	·064084
15	·072	·072	·178	·057068
16	·064	·065	·175	·05082
17	·056	·058	·172	·045257
18	·048	·049	·168	·040303
19	·040	·042	·164	·03589
20	·036	·035	·161	·031961
21	·032	·032	·157	·028462
22	·028	·028	·155	·025347
23	·024	·025	·153	·022571
24	.022	·022	·151	·0201
25	·020	·020	·148	·0179
26	·018	·018	·146	·01594
27	·016	·016	·143	·014195
28	·0148	·014	·139	·012641
29	·0136	·013	·134	·011257
30	·0124	·012	·127	·010025
31	·0116	·010	·120	·008928
32	·0108	·009	·115	·00795
33	·0100	·008	·112	·00708
34	·0092	·007	·110	·006304
35	·0084	·005	·108	·005614
36	·0076	·004	·106	·005
37	·0068	..	·103	·004453
38	·0060	..	·101	·003965
39	·0052	..	·099	·003531
40	·0048	..	·097	·003144
41	·0044	..	·095	..
42	·0040	..	·092	..
43	·0036	..	·088	..
44	·0032	..	·085	..
45	·0028	..	·081	..
46	·0024	..	·079	..
47	·0020	..	·077	..
48	·0016	..	·075	..
49	·0012	..	·072	..
50	·0010	..	·069	..
			Gauge Nos. run down to No. 80 = ·013.	

WHITWORTH WIRE GAUGE.—The Whitworth wire gauge has numbers which correspond to the number of 'mils' or thousandths of an inch in the diameter. It commences at 1 mil = ·001 inch; the steps are 1 mil up to 20, then by 2 mils up to 40, then by 5 mils up to 100, by 10 to 120, by 15 to 180, by 20 to 300, and by 25 to 500 = half an inch.

employed in the Harz mines. Wire-ropes are stranded and laid or closed in machines differing only in detail from those employed for making ordinary hemp ropes, both vertical and horizontal types of revolving machine being used. In the manufacture of the heavier wire-ropes the great weights manipulated necessitate a correspondingly massive design of plant. A wire-rope 'strand' generally contains from six to thirty-seven wires. A 'laid' rope consists of a heart (a strand either of hemp or wire), around which are twisted six strands containing a similar heart, usually covered with six wires. A 'formed' rope comprises six strands laid round a heart, but each strand consisting of eighteen wires or more in addition to the core. A 'cable-laid' rope is composed of six laid ropes closed together to form one cable. The wire may have a strength of 100 tons per square inch of section, but if the wire is harder, say 135 tons, it is necessary to use larger drums and sheaves to avoid excessive bending stresses. Flexibility is obtained by using thinner wires to build up the strands, but if the outer wires are thin they rapidly wear through if subject to friction. The system used in building up a rope depends on the service for which it is intended. 'Langs lay' for ropes subject to friction is stated to double the life of a rope, but is said to render it more liable to kink and spin. In an experimental investigation it was shown that doubling the diameter of a running sheave doubled the life of the rope used on it. The linear speed of ropes used for winding in mines and for the transmission of power may be as high as 4000 to 5000 feet per minute. The limit is imposed by the centrifugal tension set up in the rope and strength of the material of the *pulley*. Drums and sheaves should be not less than twenty times the diameter of the rope for slow speeds, but may be up to 120 times for fast-running ropes if possible. The safe load for winding is $\frac{1}{10}$th the breaking load, and $\frac{1}{5}$th for cranes, &c. Wire-ropes for outdoor use and when not running over sheaves, and ships' cargo-runners, are generally galvanised to prevent rust, by being drawn through an alkaline or acid liquor, and thence through the galvanising bath of molten 'spelter,' any superfluous metal being removed from the ropes by their subsequent passage through a bed of sand. Judicious oiling at intervals reduces the cutting action of the wires against each other and lengthens the life of the rope.

Copper wire is used for the transmission of electric current, and to ensure continuity and a degree of flexibility the wires are formed into cables on the same principle as wire-ropes; the wires may be insulated singly or in groups as well as on the outside. Copper of great purity is used, and much realisable wealth is stabilised in the distributing networks of electrical companies. Where extra flexibility is required the wires are of very fine gauge, wound together with very little twist and in sufficient number to carry the specified current. Underground cables for telegraph and telephone service contain large numbers of wires, separately insulated, and with coloured coverings to assist in ready identification at each end of a coil. Since electric cables are not made for strength, it is customary to support overhead cables by suspending them by loops from a galvanised steel cable.

See *British Wire-drawing and Wire-working Machinery* by H. Dunell (1925).

Wireker, NIGEL, or NIGELLUS DE LONGO CAMPO, a monk, perhaps precentor, of Christ Church, Canterbury, about 1190, wrote a very popular satire in Latin elegiacs, *Speculum Stultorum*, the story of Brunellus the ass and his quest of a longer tail, and a prose *Contra Curiales et Officiales Clericos*, addressed to his friend, perhaps kinsman, William Longchamp.

Wireless Telegraphy. The possibility of transmitting electric signals to distant stations without the use of a metallic wire occupied the attention of electricians and scientists for many years. As early as 1863 Clerk Maxwell demonstrated mathematically the existence of electro-magnetic waves, and suggested the similarity of these to light waves. In 1887 Hertz produced electro-magnetic waves in the ether. In 1894 Sir Oliver Lodge demonstrated that signals could be transmitted without wires by the agency of Hertzian waves. About the same time Marconi commenced his investigations, and in 1895 carried out experiments, during which he evolved a method of propagating and receiving these waves. In 1896 he brought his invention to England, where he was given facilities for displaying and developing it by the British Post-office authorities, who had been experimenting for some years upon other systems under Preece's direction. At the outset Marconi could only transmit a few hundred yards, but by the end of 1898 a distance of 12 miles was spanned when wireless communication was established between the East Goodwin Lightship and the South Foreland Lighthouse. In 1899 the first wireless messages were exchanged between England and France. The value of wireless for communication between ships at sea and between ships and shore stations was quickly realised, and many passenger liners were equipped with the apparatus, crude and limited in range as it was. In 1901 twenty-six ships of the navy and six Admiralty coast stations were fitted with the apparatus, and the first long-distance high-power station erected in England, that at Poldhu, Cornwall, was opened. Late in this year readable messages from this station were received by a ship over 1500 miles distant, and its signals were received at St John's, Newfoundland, a distance of 1800 miles, and indeed up to a distance of over 2000 miles. Since then continuous progress has been made, and to-day regular communication is carried on, on a large scale, between stations in the principal countries of Europe, and between centres in Europe and America and other parts of the world. The longest distance service is that recently established on the 'beam' system between England and Australia, a distance of 12,000 miles.

Wave-length. — Hertz had demonstrated that electric waves in the ether travel with the same velocity as light waves, viz. 300,000,000 metres per second. Each electric oscillation gives rise to one wave, and the length of the wave is, therefore, 300,000,000 metres, divided by the number of oscillations per second. The number of oscillations per second is termed the frequency of the system. This may be stated as: $\text{Wave-length} = \frac{\text{Velocity}}{\text{Frequency}}$, or $\text{Frequency} = \frac{\text{Velocity}}{\text{Wave-length}}$; or, again, Velocity = Frequency × Wave-length. The properties of a circuit which determine the frequency of the oscillating currents that will flow in it are its 'inductance' and its 'capacity,' and the wave-length (λ) in metres produced in any circuit is proportional to the square root of the capacity (C) in micro-farads and the inductance (L) in micro-henries. This law can be expressed by the following formula: $\lambda\,(\text{metres}) = 1885\sqrt{C(\mu F) \times L(\mu H)}$. Frequencies are usually expressed in cycles or kilo-cycles, thus a wave-length of 300 metres has a frequency of 1,000,000 cycles or 1000 kilo-cycles per second.

Spark System.—Marconi's original system consisted in the generation of high-frequency oscilla-

tions by means of an induction coil the ends of the secondary winding of which were connected to two spheres forming a spark-gap. One side of the spark-gap was connected to the aerial wire, and the other to earth. When a spark occurred between the two spheres the charges on the aerial and earth oscillated to and fro, and this set up the wireless waves. The waves were highly damped, that is, they rapidly diminished in amplitude, and their range was very limited. The first advance on this primitive circuit was made by Sir Oliver Lodge, who, in 1897, introduced the principle of 'syntony,' and obtained more prolonged oscillations and better selectivity. In 1900 Marconi introduced an improved method of producing less damped waves by separating the exciting from the aerial circuit, and coupling them together by means of a specially designed transformer which he termed a 'jigger.' An alternator and transformer were used in place of the induction-coil and battery, but the main factor in this improved system was the introduction of carefully 'tuned' circuits, that is, the oscillating and the aerial circuits were adjusted for definite identical rates of oscillations. The next important improvement was the introduction of the Marconi rotary 'disc' discharger. This apparatus consists of a metal disc mounted on, but insulated from, the alternator shaft, which carries a number of studs standing out from the periphery of the disc. On a fixed ring encircling the disc are two rods, so arranged that the studs on the disc pass the ends of these rods at every revolution within a distance of one or two millimetres. These rods are electrically connected to the secondary of the main transformer. Each time a pair of studs is opposite these two rods, which occurs only at the maximum amplitude of the alternations, a spark passes. By this means the frequency of the alternator and the frequency of the sparks are in tune. These again are in unison with the natural frequency of the alternator circuit, the spark circuit, and the aerial circuit. Thus, so long as the sending-key is depressed, an almost continuous flow of waves is set up of nearly constant amplitude. The alternator has a frequency of 300, although 500 is used in some cases, and this is impressed on the trains of waves and governs the pitch of the note heard in the receiving telephones. The note has a vibration corresponding with the spark frequency, which is double that of the frequency of the alternator.

Quenched Spark.—This system, invented by Professor Wein, was introduced by the Telefunken Company in Germany in 1908. In it the exciting circuit generates a series of independent short oscillations of a powerful nature which transmit a sequence of kicks or shocks to the aerial circuit. This is attained by using a number of very small spark-gaps in series, the gaps being formed by a series of circular copper electrodes separated by rings of mica.

Spark transmitters are still much used on ships, and many land stations of this type are still in operation. The tendency is, however, for the 'continuous-wave' method to supplant the 'spark.'

Continuous Wave-system.—It was long felt that better signalling ranges and greater selectivity would be obtained by the use of continuous undamped waves, that is, waves of constant amplitude, and the following methods of generating these waves have been introduced, viz. the 'Poulsen arc,' the 'high-frequency alternator,' and the 'thermionic valve.'

Poulsen Arc.—William Duddell discovered in 1900 that if the carbons of an arc lamp were supplied with direct current, and the arc shunted by a circuit containing inductance and capacity, the arc could give out continuous oscillations. This principle was developed by Poulsen in 1902; and after experiments in transmitting over short distances, satisfactory signalling was carried on in 1906 between Lyngby in Denmark and Cullercoats in Northumberland, a distance of 530 miles. In 1909 the system was taken up energetically by C. F. Ellwell in America, and in 1912 the first long-distance service on this system was established, viz. that between San Francisco and Honolulu, a distance of over 2000 miles. Many stations of different powers ranging from 5 kilowatts (kw.) upwards have since been installed both on ships and on land in all parts of the world. The most notable arc stations are Bordeaux, of 1000 kw. power and equipped with eight self-supporting steel masts, each 820 feet in height; and Java, of 2400 kw. The latter is the largest power used by any single transmitter, and is designed for communication with Holland. A unique feature of this station is the method of supporting the aerial. It is secured to a mountain which, at its highest point, is over 2000 feet above the station. In England the principal arc stations in operation are (*a*) the Admiralty station, 100 kw., at Horsea Island, Portsmouth, opened in 1914; (*b*) the Post-office station at Leafield, 250 kw., opened in 1921 (this station communicates with one of similar power at Cairo, Egypt); and (*c*) the Post-office station at Northolt (London), 25 kw., opened in 1922 for communication with continental stations.

The High-frequency Alternator.—This is an alternating-current generating machine of most ingenious design, and so constructed that it delivers continuous oscillations to the aerial at high frequencies. Fessenden, an American wireless inventor, designed the first machine in 1907. In 1909 Dr Rudolph Goldschmidt designed machines of 150 kw. having a frequency of 48,000 cycles per second. These were installed at Hanover (Germany) and Tuckerton (New Jersey, America), and worked very successfully. About the same time E. F. W. Alexanderson of America produced a machine having a frequency of 100,000, the rotor of which was driven at a speed of 20,000 revolutions per minute. Further progress has been made in the design of these machines by Alexanderson and also by Latour of France. Frequency-raisers have been introduced in some countries for operation with them. Alternators are now largely used in high-power stations, both in America and on the Continent, using powers up to 500 kw. At Carnarvon a 200 kw. transmitter of the Alexanderson type is in regular use (alternatively with a 100 kw. valve-transmitter) for communication with New Brunswick and other stations in America. At the Sainte-Assise station, situated about 25 miles from Paris, and known as 'Paris Radio Central,' several high-frequency alternators of different powers are in use. The largest, which is 500 kw., is used for trans-oceanic communication, the aerial employed being supported by sixteen steel towers, each 830 feet high.

Thermionic Valve System.—The thermionic valve-transmitter is a development of the original two-electrode valve invented by Professor J. A. Fleming in 1904. The 'Fleming' valve consists of an exhausted glass bulb containing two electrodes, one being a filament of carbon or tungsten (the cathode), and the other a small metal plate (the anode). When the filament is heated by current from a battery, electrons (negative particles of electricity) are free to be thrown on to the plate, but they do not constitute a current until they are given direction by a suitable electro-motive force applied across the space between the filament and the plate. Normally the electrons are held to the filament by the plate being given

a slightly negative potential by means of a battery and potentiometer. For some years this valve was used as a detector and rectifier of high-frequency oscillations. When so used the positive half of each incoming oscillation gives a positive potential to the plate which attracts the electrons from the filament. The negative half of each oscillation gives the plate a negative potential which repels the electrons, and so, with each train of oscillations, the positive halves produce unidirectional current impulses which act on the diaphragm of the telephone receiver. In 1907 Professor Lee De Forrest introduced a third electrode, the grid, to the valve. A constant potential is applied between the filament and the plate, so that for any given temperature of the filament a constant flow of electrons from the filament to the metal plate takes place. The grid can be given either a negative or a positive potential in relation to the filament, and thus gives a means of controlling this flow. In 1913 Meissner produced continuous oscillations by 'reaction,' that is, by a transference of a small part of the energy released in the plate-circuit back to the grid-circuit, thus raising the grid-voltage and consequently the plate-current to a much higher value.

Suitably connected, the three-electrode valve can be used as a generator of high-frequency oscillations, as a receiver and amplifier of high-frequency oscillations, as a rectifier of such oscillations, and as an amplifier of low (audible) frequency currents. In general practice for transmitting purposes valves of suitable dimensions to give outputs up to 25 kw. are employed, though a valve, rated at 100 kw., has been introduced at the Schenectady broadcasting station of the General Electric Co. of America. It is water-cooled, stands 7½ feet high, and weighs about 100 lb.

A typical valve-transmitter of medium power is operated by means of current from a motor-alternator at a voltage of about 500. This is applied through a transformer to 'Fleming' valves, which rectify it and pass it on at a voltage ranging from 7000 to 12,000 to the plates of the oscillation (three-electrode) valves, whence it is connected either direct or through a coupled circuit to the radiating system. The plant comprises tuning, smoothing, and controlling devices. Where it is of importance that the transmitted waves should be maintained at a constant frequency, it is usual to employ a means of controlling the oscillations. On Marconi stations this is done through the medium of a separate oscillator termed the 'independent drive,' which is adjusted to the wave-length of the station, and imposes its steady frequency upon the aerial oscillatory system.

For long-distance wireless services other countries have adopted either the high-frequency alternator or the arc, but in England the valve-transmitter has been developed and employed for this purpose. A notable achievement by the Marconi Company in this connection was the transmission in November 1921 of messages to Australia from a powerful valve-set designed and installed for the purpose of the experiment at their Carnarvon station. Up to this time the largest valve-transmitters in operation were those of the Marconi Company at their Ongar station, where sets of from 5 to 50 kw. outputs were in daily operation communicating with stations of corresponding power at Paris, Madrid, Vienna, Bern, and Glace-Bay (Newfoundland). These sets are still in regular service, and others have since been installed for communication with Lisbon, Prague, and Moscow. They are operated over wires from a central office in London by means of automatic 'sending' apparatus, and speeds up to 100 words a minute are attained on some of the services. To avoid interference from the transmitters, the receiving apparatus is located at Brentwood, about 15 miles distant. The incoming signals are picked up on outdoor double-loop directional aerials, each of which is connected to its particular valve-receiving apparatus. This comprises a series of high-frequency amplifying valves and filters, and is of an extremely efficient character. After rectification the signals are further amplified and then passed over wires to the London office, where they are produced in Roman type by means of automatic type-printing instruments. These instruments are associated with the 'sending' apparatus belonging to the particular service, and thus the equivalent of 'duplex-working' on a land telegraph line is achieved. Similar valve-transmitters belonging to the Post-office are in use at Devizes (6 kw.), Northolt (30 kw.), and Stonehaven (30 kw.). The receiving-station for these transmitters is situated at St Albans. The various services are operated over land lines from the Central Telegraph Office, London. Following the success of the Marconi Company's transmissions between Carnarvon and Australia, the British Post-office decided to employ for the Imperial wireless stations then under consideration valve-transmitters of higher power and greater range than those previously contemplated, and the design of these stations was proceeded with.

Beam System.—On the 2nd July 1924, Marconi delivered an address, generally regarded as of an epoch-making character in wireless science, before the Royal Society of Arts, on experiments which he had carried out in short-wave directional telegraphy and telephony. In his early work he had experimented with short waves, but signalling over very short distances only was found possible. Better results were obtained with long waves, and the development of the science proceeded with long waves. He had always kept in view the possibility of employing with advantage in long-distance services short waves with 'reflectors.' He had already evolved the 'revolving beam transmitter' for the protection of ships at sea, referred to further on. In his address he showed that with a specially-designed vertical aerial, having parallel 'reflector' wires at the rear of the antenna wires and properly spaced in respect to the wave-length employed, the waves, instead of being radiated in all directions, as from an ordinary aerial, could be projected in any particular direction desired in the form of a beam like the light beam from a search-light. The beam would occupy some 10 degrees only out of the 360. To permit of the lowest possible power being used in signalling, it would be necessary for the aerial at the receiving-station to be of the same 'reflector' design and facing the distant transmitter. In the tests it was found that the strength of the short-wave signals received at a station was much reduced, and would die away altogether at times, during the hours of sunlight. (In tests with Canada, reception was maintained during 16 hours out of the 24.) Notwithstanding this drawback, it was demonstrated that with this system the speed of working would be so much higher that stations of comparatively low power would be capable of transmitting a far greater number of words in the 24 hours than would be possible by means of the costly high-power long-wave stations then contemplated. The great advantages claimed for the new system were lower capital costs, higher working speeds, greater secrecy in operation (only stations coming within a certain angle of the beam would receive the signals), greater freedom from atmospherics, and greater freedom from mutual interference between stations. In view of these advantages, the British Post-office decided to substitute the new system

for the high-power stations then under construction for Imperial services between England and Canada, Australia, South Africa, and India, and contracts were placed forthwith with the Marconi Company for the erection of these stations under guarantees as to their signalling performances. As the stations in England would be individually directional, they could not be used for broadcasting throughout the empire; and as such a station was desired, the high-power long-wave station then in course of erection at Rugby was carried through to completion for this purpose.

The Rugby station was opened on the 1st January 1926. It was designed by the engineers of the British Post-office and constructed under their supervision. The station is a masterpiece of engineering skill, and is probably the most efficient long-distance high-power station in the world. With suitable receivers its signals can be received all over the globe. Only the salient features of this interesting station can be given here. The mast and aerial systems comprise twelve masts of steel lattice construction, each 820 feet in height of triangular form with 10-ft. sides, and two main aerials, one of which is used for telegraphy transmissions and the other for the transatlantic telephony service. The earth system for the telegraphy-transmitter consists of a network of copper wires laid a few inches below the surface of the ground and extending 800 feet on each side of the aerial. The power required is obtained from a local supply. It is three-phase, fifty-cycle alternating current having an earthed neutral and 12,000 volts between phases. This supply is converted to a low tension of 416 volts by means of transformers, and connected through switching-panels and other controlling and safety devices to the various machines used in the station. For the power requirements of the various sections of the valve-transmitter, and to provide power for simultaneous transmissions on the two aerials, three motor-generator sets are provided, each having an output of 500 kw. at 7000 volts direct current. The valve equipment is divided into power units, each comprising eighteen water-cooled valves, each capable of giving an output of 10 kw. There are five such units, and the power available is, therefore, 900 kw. On the telegraphy-transmitter it is usual to employ three of these units, giving approximately 500 kw. in the aerial. One of the many unique features of the station is a valve-operated tuning-fork, having a frequency of 1777 cycles per second, which is employed (the ninth harmonic of this frequency, viz. 16,000 is used) for controlling the frequency of the oscillations of the transmitter. The transmitter is operated over a land line from the Central Telegraph Office, London, by means of automatic apparatus, at a speed of eighteen words per minute. At this slow speed the signals can be read aurally by Morse operators. The station is in operation throughout the twenty-four hours of each day, and is used not only for the dissemination of government news, but also for the transmission of commercial messages to ships anywhere in the world.

Beam Stations.—The Post-office beam-transmitters for communication with Canada and South Africa are located on the same site near Bodmin, Cornwall, and those for communication with Australia and India on a site at Tetney near Grimsby. The respective receiving-stations are situated near Skegness and near Bridgwater. The erection of the stations was commenced in April 1925. The service with Canada was opened for public use on the 24th October 1926, that with Australia on the 8th April 1927, that with South Africa on the 4th July 1927, and that with India at midnight 5th–6th September 1927. The stations are operated by land line from the Central Telegraph Office in London. In the official tests of the Canadian service speeds of 1250 letters per minute in each direction were maintained during several hours each day, the average speed for the whole period of the tests being 650 letters, equal to 130 five-letter words per minute in each direction. During the tests of the Australian service high-speed working was carried on for approximately thirteen hours each day, and an average of 150,000 five-letter words per day was transmitted. On a number of occasions a speed of 340 words per minute was attained in each direction, or 680 words per minute in all. The power delivered to the aerials of these transmitters is about 25 kw. The wave-lengths used on these services are 16·6 and 32·4 metres for Canada, 26 metres for Australia, 16 and 34 metres for India, and 16 and 34 metres for South Africa. Where two wave-lengths are employed, the shorter is used for daylight and the longer for night communication. The corresponding distant-transmitters use slightly different wave-lengths. The masts are of steel lattice construction, and carry at their summits cross-arms, which support steel triatic cables from which the aerial and reflector wires are suspended. On the Canadian and South African services the masts, five in number for each, are 287 feet in height to the top of the cross-arm, and are spaced 650 feet apart. The cross-arms are 90 feet in length. On the Indian service there are also five 287-ft. masts. On the Australian service there are three masts only, 260 feet in height. On this service it is found that better communication is obtained by signalling in the easterly direction in the evening and in the westerly direction in the morning, and to permit of this two parallel rows of vertical aerial wires with vertical reflector wires fixed between them are provided. The route in the westerly direction is across the Atlantic and Pacific Oceans. It is approximately 12,000 miles, and is the longest direct telegraph service in the world. The masts are erected, in each case, in a straight line at right angles to the great circle bearing on the distant station. The power at the Tetney station is obtained over an underground cable from the Grimsby corporation's supply. The plates of the transmitting-valves are supplied at 8000 to 10,000 volts from single-phase alternators at 1000 volts, 300 cycles, after passing through step-up transformers, rectifying valves, and smoothing apparatus. The receiving stations at Skegness and Bridgwater are equipped with mast and aerial systems identical with those at the transmitting stations, and erected at right angles to the direction from which the signals are received. The effect of the reflector wires at these stations is not only to screen the aerial wires from interference from behind, but also to reflect back to the aerial energy received from the front of the system.

Other beam stations are being erected by the Marconi Company at Dorchester for commercial services, to be operated by themselves, with Rio de Janeiro and Buenos Aires. Other similar services to be established on the same site for communication with the United States, Egypt, the Far East and elsewhere, are under consideration. The receiving station for these services will be located at Somerton in Somerset.

Long Waves.—On long-wave services waves varying from 300 to 23,400 metres in length are used. 300 and 600 metres (the latter is the standard) are used for spark communication between ships, and between ships and shore stations. A wave-band of 2100 to 2400 metres is reserved for continuous-wave working between ships and land stations. The Rugby station's wave-length is 18,740 metres, while the

longest wave-length in use is that of the Bordeaux station, viz., 23,450 metres. In a long-wave transmitter the aerial forms one side of the oscillatory system and the other side is usually connected to earth. In some cases an 'earth-screen' or 'counterpoise' consisting of a network of insulated wires erected on poles is employed in place of the earth. The earth's surface has a considerable effect on the distances to which the waves will flow. The strength of the signal falls off continuously as the distance from the transmitter increases, due to the absorption of the energy by the earth. There is less absorption of energy over water than over land, and it may be said that the range of a transmitter of a given power is twice as far over sea as over land. The wave-length employed has also an important bearing upon the distances to which signals can be transmitted. The shorter the wave—the oftener the wave has its feet upon the earth—the greater is the attenuation, and the abstraction of energy becomes so great when wave-lengths below say 1000 metres are used that the signal strength falls off too rapidly for long ranges to be attained. During the hours of darkness, however, the range of a station using these wave-lengths is generally trebled, and under specially favourable atmospheric conditions the signals are often received over very great distances. On long waves 'atmospherics' are a serious hindrance, especially in the tropics. Directional aerials and receivers are a great help, but much remains to be done to bring about a really satisfactory means of eliminating the interference due to this cause.

Short Waves.—With short waves from about 5 to 150 metres different phenomena are encountered. These waves do not travel far when propagated over the earth as they quickly become attenuated from absorption, but when they are sent out at an upward angle they reach the ionised region of the upper atmosphere (the 'Heaviside' layer) and are there deflected at an angle towards the earth where they are received at great distances and with great strength. When the ray strikes the 'Heaviside' layer a portion of the energy may be scattered and be received directly below, but in general, short waves propagated in this manner are not received in the intervening 'skip' or 'jump-over' area. The 'skip' distance varies from day to day and from summer to winter, but increases as the wave-length is reduced. One investigator found that with a wave-length of 30 metres the 'skip' distance in daylight may be about 500 miles, but in the dark in summer it may increase to 2000 miles, and in winter to 4000 miles. Prior to the publication of the results of Marconi's experiments much useful work with short waves was done by amateurs. Since then the subject has received the attention of wireless engineers and enthusiasts in all parts of the world. Amateurs using powers in their aerials of from 100 to 500 watts and without reflectors have communicated between Great Britain and the antipodes. The British Post-office with a set installed at their Leafield station, and working on 24, 32, and 56 metres with about 4 kw. in the aerial, are able to transmit commercial traffic to Halifax (Nova Scotia) during about 18 hours of each day, and to Cairo during about 8 hours of each day. At Nauen, Germany, signalling has been carried out with Buenos Aires on a wave-length of 20 metres with 2 kw. in the aerial, using a horizontal aerial having a movable reflecting system arranged to project a beam slanting upwards towards the sky. The complex phenomena associated with the propagation and detection of short waves are not yet fully understood. The causes of 'fading' are not yet clear. At different times of the day and seasons of the year different results are obtained on the same wave-length. One station may receive signals well, while the same signals cannot be detected at another station just a few miles distant. Great progress is, however, being made in the investigation of these phenomena, and already a large number of long distance transmitting stations working on wave-lengths ranging from about 10 to 150 metres have been installed by commercial companies and government administrations throughout the world. One great advantage of short-wave over long-wave communication is that the signals are not affected by 'atmospherics' to anything like the same extent. Waves of from 5 to 10 metres are used for certain special services over short distances, but these waves are unsuitable for communication over long distances as they appear to be entirely absorbed by the 'Heaviside' layer.

Reception.—Various types of detectors of wireless waves have been employed, including the 'Coherer,' the 'Magnetic Detector,' and the 'Electrolytic,' but these have all given way to the 'Crystal' and the 'Thermionic Valve.' The crystal is still largely employed for spark reception, but most passenger vessels and practically all land stations are now equipped with valve receivers. For receiving signals transmitted by hand up to say 40 words per minute the telephone is used for conveying the signals to the ear of the operator. The incoming waves are at so high a frequency that the telephone diaphragm is insensitive to them, and it is necessary so to modify or rectify them that they will act upon the diaphragm. The crystal, introduced in 1906, has the property of rectifying the waves, that is, it allows only one alternation of each wave to pass through it. In the spark system each spark produced at the transmitting station causes a train of waves to be radiated from the aerial, and each such train, due to the action of the crystal, is heard in the receiving telephone as a single current impulse or click. A succession of sparks produced by the transmitter is, therefore, received as a succession of clicks, corresponding with the spark frequency of the transmitter, and these clicks following each other very rapidly are heard as a 'buzz' in the telephone of a duration in each case coincident with the length of time the distant sending-key is depressed. In this way the signals are heard in the long and short symbols of the Morse code. As the effectiveness of the crystal as a detector and rectifier is due to the incoming waves being of an interrupted character, that is, they come in trains corresponding with the spark discharges of the transmitter, it is unsuitable for detecting continuous waves which are radiated in a continuous stream with each depression of the sending-key. In continuous wave working the thermionic valve already described is now used, in conjunction with the 'heterodyne' method of detecting the signals, invented by Fessenden in 1906, or the reaction method (auto-heterodyne) introduced by Meissner in 1913. In the heterodyne method the incoming waves, which are of definite frequency and amplitude, and are received during the period of each depression of the sending-key at the distant station, are acted upon by a local oscillator, which superposes upon them waves of a slightly different frequency. The altered frequency of the combined waves produces 'beats' which, when rectified, actuate the telephone in the same way as in crystal reception. In the reaction method an inductive coupling is provided between the plate and grid circuits of the receiving valve. With a suitable adjustment of this coupling, and of the plate and aerial circuits, continuous oscillations are produced in the system. The incoming oscillations from the sending station are at a slightly different frequency from those generated locally and 'beats' are produced, due to the difference in the rates of the two frequencies. Many designs

of valves and of single and multiple-valve receiving sets are used. The high-frequency currents picked up by the first valve are amplified by succeeding valves. They are then 'heterodyned,' rectified, and further amplified to whatever strength may be required for reception. In high-speed reception the signals are strengthened in this manner sufficiently to actuate an electro-magnetic relay, which, with the aid of a local supply of current, operates tape-recording or type-printing instruments. A frame aerial is sometimes used with the set in order to obtain directional effects and to eliminate interference from atmospherics and from signals from other stations.

Direction-finder.—In 1907 Bellini and Tozi invented the radio-goniometer or wireless direction-finder. This apparatus has been largely installed at coastal stations in different parts of the world for the purpose of giving vessels at sea their positions in heavy or foggy weather. It provides a means for determining accurately the actual point of the compass from which incoming signals at the direction-finder station come. During the World War the system was adapted by Round for locating the positions of enemy wireless stations, submarines, and aircraft, and in this work it was of immense value. It is on record that by means of a system of these stations the movement of the German fleet from its shelter at Wilhelmshaven into the North Sea was observed and reported with such promptitude and accuracy that the British Grand Fleet was able to bring it to action in the battle of Jutland.

Revolving Beam Transmitter.—An interesting development for the protection of ships at sea is a 'revolving beam' transmitter, introduced by Marconi in 1922, which is, in fact, a 'wireless lighthouse.' It enables a vessel to obtain bearings during fog. The plant includes a reflector of special design and an apparatus which revolves continuously when in use, and signals at every two points of the compass a different letter in the Morse code. A wave-length of 6 to 7 metres is employed, and the signals are picked up by a special receiving apparatus on the ship. By observing the Morse letters which the receiving instrument produces the navigator is able to tell the direction of the transmitter and direct his course accordingly.

Signalling in Coal-mines.—Tests carried out in 1923 at the experimental coal mine of the United States Bureau of Mines proved that signals could be distinctly heard through 50 feet of coal strata, although the audibility fell off rapidly as the distance was increased.

Other Uses.—Among the many uses to which wireless telegraphy is put is the sending out of accurate time-signals by several of the high-power stations of both Europe and America for the guidance of navigators, and also the transmission broadcast of news. On most of large passenger vessels daily news bulletins are issued. The transmission of pictures by wireless waves is another interesting feature. A further development of this art, viz. the transmission by means of short waves of written or printed matter or other documents and their reception in fac-simile form has made great progress, and, when perfected, promises completely to revolutionise wireless telegraphy methods.

Wireless Telephony. The remarkable progress made in this science is entirely due to the 'thermionic valve,' and the general principles on which the science has been developed are the same as in Wireless Telegraphy (q.v.).

Telephony Transmitter.—A valve-transmitter designed to send out waves 300 metres in length has a frequency of 1,000,000 per second. Speech waves vary in frequency from say 30 to 1500 per second and music from say 20 to 6000 per second. A valve-transmitter radiates continuous-waves of constant frequency and amplitude as in Wireless Telegraphy. A microphone is connected to the transmitter, and the effect of speaking into it is to modulate the amplitude of the continuous-waves in consonance with the movements of the diaphragm of the microphone. The continuous-waves are, therefore, in the nature of a 'carrier' for the sound waves, and it may be said that they reach the receiving aerial with the slow, or low, frequency sound variations superposed upon them. In wireless transmissions the intensity of the signals decreases in proportion to the square of the distance between the transmitter and the receiving point. In Wireless Telegraphy the strength of signal received at any point mainly depends upon the aerial energy of the transmitter, i.e. practically the whole of the energy supplied to the oscillation valves is available for radiation from the aerial. In Wireless Telephony, however, the signal strength is dependent not only on the amplitude of the continuous (carrier) waves which it radiates but also upon the degree to which the sound modulations are impressed upon these waves. The range of a valve-transmitter of given input power when used for telephony may, therefore, be said to be about a third of that of the set when used for telegraphy. A valve telephony transmitter is generally similar to a telegraphy transmitter with the addition of the modulating valves, and the microphone equipment. In the early stages carbon microphones similar to those employed in ordinary telephony were used (these are still employed on low-power transmitters), but with the development of the art special types have been designed to reproduce with greater faithfulness the acoustic frequencies and amplitudes that occur in music. The most successful of these microphones are the 'Reisz' and the 'Marconi-Sykes.'

Telephony Reception.—In receiving telephony the tuning apparatus is adjusted to the same frequency as the continuous-waves emitted by the transmitting station. Both 'crystal' and 'valve' receivers are used. The crystal both detects and rectifies the waves. It has the property, due to its nature, of allowing only one alternation of each wave to pass through it. Consequently one side only of each group of continuous-waves contained in each period of a speech or music wave passes through the crystal; this causes a deflection of the diaphragm of the telephone receiver corresponding with the movement of the diaphragm of the transmitting microphone. Each succeeding group of continuous-waves, modified to the form of the speech or music wave superposed upon it, acts in a corresponding manner, and so the successive variations of the amplitude of the transmitted continuous-waves produced by the ever-varying frequency of the speech or music waves directed upon the microphone diaphragm are reproduced in the telephone receiver. In valve reception the three-electrode valve is employed, and the principles on which it operates are generally the same as in Wireless Telegraphy. Where a single valve is used it is so designed that it acts both as an amplifier and as a rectifier of the incoming continuous-waves, and, due to its amplifying properties and to the application of 'reaction,' it is much more efficient than the crystal. Many of the listeners on broadcasting systems employ detectors of the crystal type. With a crystal set an efficient outdoor aerial and a good earth are essential. In Great Britain the length of the aerial is restricted to 100 feet including the down-lead. A single wire gives satisfactory results. It should be as high as possible (30 to 40 feet is a useful height), well insulated, and kept well away from

trees, walls, and roofs. The leading-in wire should be as short as possible, and taken directly (without bends) to the set. The earth wire should also be as short and direct as possible, and the earth itself should be good. A coil of bare wire or a small sheet of galvanised iron buried a few feet deep in moist earth near the set are preferable to a water pipe, especially if the latter should have a long run before it enters the earth. Gas pipes should be avoided. All joints on the aerial and earth wires should be soldered. With a good aerial and earth a crystal set is capable of receiving broadcast transmissions at distances up to about 25 miles from a 1·5 kw. transmitting station. Many types of valve sets are employed, containing as many as six or even more valves, and some of the more elaborate sets are provided with self-contained frame aerials. On a well-designed set having the necessary tuning-coils and suitable amplification it is possible to tune in and receive the broadcast transmissions from any of the British stations and also from most continental stations. With proper amplifying valves loud-speakers can be employed, and though with many instruments of this class there is an amount of distortion which renders the reproduction unsatisfactory, there are prospects of great improvements being effected.

Development of Wireless Telephony.—Prior to the World War but little headway had been made. Early in 1914 Marconi carried out experiments between warships of the Italian navy, and succeeded in speaking over a distance of about 50 miles. In 1915 the Arlington (Washington) station was successful in telephoning experimentally to Honolulu and also to the Eiffel Tower, Paris, using a Poulsen arc transmitter. During the war the valve was introduced as a transmitter in telephony, and both the British Admiralty and the War Office made use of it, the former for communicating between ships and the latter for communicating with aircraft. After the war rapid progress was made. Greater reliability and range were obtained, and in 1919 the Marconi Company produced for commercial purposes sets adapted for both telegraphy and telephony, and suitable for ranges up to 200 miles. In this year the company carried out tests across the Atlantic and good results were obtained, using two 1·5 kw. valves. In 1920 this company introduced the 'duplex' system, which does away with the necessity for 'changing-over' from speaking to listening. On the 18th December 1921 a demonstration of 'duplex' telephony between London and Amsterdam was given, the circuit being arranged by means of a Post-office trunk line between London and the wireless station at Southwold, and a similar arrangement was made in Holland between the Zanvoort wireless station and Amsterdam. An unusually short wave-length was employed, which gave immunity from interference from other stations.

Wireless Call Bell.—In 1920 the Marconi Company introduced a wireless call bell, by which any particular station in a group can be called without the attention of the other stations being attracted. The call is given by the sending out of waves on a specific wave-length for a definite period of time. The received signals operate a slow-acting mechanism, which will only respond to oscillations of the particular wave-length to which it is tuned, and then only if the signals are continued for the time required.

Broadcasting.—The lack of secrecy which, with other factors, has militated against the application of the wireless telephone for commercial purposes is a feature of the system which was quickly taken advantage of for broadcasting purposes, particularly in America. There broadcasting was started in 1919 by amateurs giving gramophone concerts and other entertainments to each other. In a very short time it developed to an enormous extent, the larger stations being established, chiefly by the electrical manufacturing companies, with the object of advertisement. There were but few government restrictions, and with the indiscriminate erection of stations serious interference and 'jamming' resulted. The position became so chaotic that the government eventually intervened and a degree of order was established, the various transmitting stations in one city agreeing to operate to a time schedule, one station following another throughout the day and evening. It was estimated that at the end of 1926 there were 650 transmitting stations in operation.

In England broadcasting was started in 1920 by the Marconi Company from a station at Writtle, near Chelmsford. Regular concert programmes were given; and special transmissions, using as much as 15 kw., were also sent out. Some of these were picked up by ships at sea 1000 miles distant, and also at St John's, Newfoundland. When Dame Nellie Melba sang into the microphone at Chelmsford, June 1920, the transmission was marred by atmospherics in some directions, but in others, even at great distances, the singing was heard with great clearness. Progress in Great Britain was slower than in America, owing to the desire of the government to maintain a proper control over the business and to avoid the unsatisfactory conditions which arose in America. As a result of this policy the British Broadcasting Company, a combination of six of the principal firms of manufacturers of electrical plant in England, was formed in 1922 under the authority of the government. The company divided the country into zones, each having a radius of roughly 100 miles, and a broadcasting station was established in each zone, the location of the stations being London, Birmingham, Bournemouth, Cardiff, Glasgow, Manchester, Newcastle, Aberdeen, and Belfast. The first London station (2 LO) was situated at Marconi House. It was opened on the 11th May 1922, and was of 1 kw. power; the other stations followed soon afterwards. Later 'relay' stations were installed at Sheffield, Plymouth, Edinburgh, Liverpool, Hull, Dundee, Swansea, Stoke-on-Trent, Leeds, and Bradford. These stations are operated on wave-lengths within the 300 to 500 metres wave-band. The main stations are designed to use a power in the aerials of 1·5 kw., with the exception of the London station, which uses 3 kw. The relay stations are of low power (about 200 watts in the aerials), and are only intended to serve the towns in which they are located. In July 1925 a high-power station was opened at Daventry. It works on a wave-length of 1600 metres, and gives about 25 kw. in the aerial. The programmes sent out by this station are produced in the studios of the London station, and are thence passed over wires to the transmitter at Daventry. When desired, simultaneous broadcasting is arranged over telephone trunk-wires provided by the Post-office. By this means any number or all of the broadcasting stations can be connected to the originating microphone. In January 1927 the British Broadcasting Company was taken over by a government-controlled body styled 'The British Broadcasting Corporation.' Licences are issued by the Post-office for the installation of receiving-sets at a charge of ten shillings a year. At the end of March 1927 the number of licences issued was over 2,250,000. Wireless clubs and societies have been formed at a great many centres throughout the country for the purpose of promoting the advancement of wireless science. The parent society, 'The Wireless Society of London,' was formed in July 1913, when its chief interest was wireless telegraphy.

This society is now 'The Incorporated Radio Society of Great Britain,' and to it many of the local societies have become affiliated.

On the 26th and 27th November 1923 successful broadcasting tests were carried out across the Atlantic. Certain of the American broadcasting stations had been received in England on many occasions previously, but this was the first time in the history of wireless that American listeners were able to receive telephony transmissions from British stations. Senator Marconi and M. Georges Carpentier spoke to America from '2 LO,' the London station.

On the 24th April 1924 the proceedings in connection with the opening of the British Empire Exhibition at Wembley, including speeches by the King and the Prince of Wales, were simultaneously broadcast by all the stations of the British Broadcasting Company. The transmission was most successful in every way, the speeches in particular being heard with remarkable clearness by all listeners throughout the country.

Broadcasting is now a recognised means of entertainment, and stations have been established in all the British dominions and India and in all the principal countries of the world. The only crown colony possessing a station is Ceylon. This station, opened in 1925, is located at Colombo. It sends out a programme daily on 800 metres, and is received satisfactorily up to distances of over 1500 miles. In Europe the number of stations had so increased that serious 'jamming' between stations on approximately similar wave-lengths resulted. This difficulty was brought under the control of the technical representatives of the various European broadcasting organisations, who met for the first time at Geneva in March 1925, and the position is now more satisfactory.

Long-distance Commercial Services.—In the closing months of 1922 investigations were carried out by the Radio Corporation of America and the American Telegraph and Telephone Company with the object of obtaining data to permit of the designing of apparatus suitable for a transatlantic wireless telephone service. Dr H. W. Nichols conducted the investigations in England. In connection with his experiments a special transmission was given, commencing at two o'clock on the morning of Sunday the 14th December 1922, from a station erected on Rocky Point, Long Island. A wire connection between New York and the wireless station enabled the speakers in New York to speak direct to London. The transmitter was specially designed, and special valves, giving a total output of 60 kw., were used. The speeches were heard with great distinctness by the sixty listeners who had assembled in London to witness the experiment. A unique feature of the transmissions was the employment of the 'single-side-band' method of operation. In this system the carrier-wave and one of the side-bands of waves are filtered out before they reach the aerial, and one side-band only is radiated. The carrier-wave is reintroduced at the receiving end by means of a low-power valve oscillating at the frequency of the carrier-wave and upon these local oscillations the incoming 'single-side-band' waves are impressed and the originating speech reproduced. Following the success of Dr Nichols's investigations, a powerful telephony installation was erected at the Post-office station at Rugby, where further experiments were carried out in both directions. These eventuated in the system being opened for public service between New York and London on the 1st January 1927. It was later extended to all the principal towns in both countries. The system makes use of one of the aerials and a portion of the power plant installed in the first place in connection with the Rugby station's telegraphy service. The power put into the aerial is of the order of 100 kw. There are many very interesting features in this installation, and not the least is the 'single-side-band' method of operation developed during the experiments.

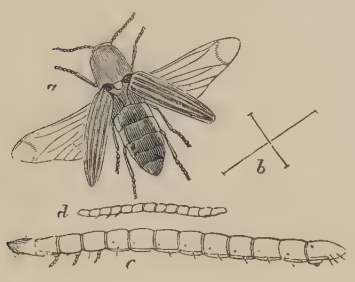
Short-wave Telephony.—The remarkable developments in recent years in short-wave telegraphy have been accompanied by equally wonderful achievements in short-wave telephony. On the 30th May 1924 speech was transmitted to Australia for the first time by Marconi from an experimental station at Poldhu, Cornwall. A wave-length of 92 metres was used, and the total power employed was 28 kw.—i.e. 18 on the main valves, 8 on the modulating valves, and 2 on the drive valves. Transmissions on carrier-waves of the order of 30 metres are received regularly in this country from America and other distant countries, and amateurs operating with from 100 to 500 watts in their aerials and using similar wave-lengths are able to communicate regularly at certain hours with stations in the antipodes.

On the 14th May 1927 an address was broadcast by the Dutch Colonial Minister to the inhabitants of the Dutch East Indies from an experimental transmitter at Eindhoven, Holland, on 30·2 metres. It was received successfully at Java and other places in the Far East. On the 20th May 1927 the same station picked up the programme of the Daventry station, and rebroadcast it on the same wave-length. It was successfully received in Australia, South Africa, and India. At the Sydney broadcasting station it was retransmitted, and was heard with great clearness by a great many listeners throughout the country. This achievement was specially noteworthy, inasmuch as it was the first time a London programme had been received and rebroadcast in the antipodes. The British Broadcasting Corporation are now carrying out experiments with a view to installing a short-wave transmitter at the Daventry station for the sending out of programmes to be picked up by stations throughout the empire and rebroadcast. Experiments have already been carried out on the short-wave 'beam' stations recently established for wireless telegraphy communication with Canada and Australia, and it has been found possible to superpose telephony modulations on the 'beam' waves without interfering with the efficiency of the latter for telegraphy purposes and without causing distortion of the superposed telephony transmissions. It may therefore confidently be predicted that by this means regular telephony services will be inaugurated before long between Great Britain and each of the dominions and India, and it may be found expedient to use these services also for broadcast transmissions to the respective countries.

Other Uses.—The wireless telephone has been applied in a number of other directions, such, for instance, as the directing of aircraft in flight in foggy weather and the reception of broadcast transmissions on moving railway-trains, but space does not permit of further reference to the wonderful advances in this, the most fascinating, probably, of all recent scientific developments.

Wire-worms, the grubs of click beetles (Elater or Agriotes), perhaps the most injurious of farm pests, destroying root, grain, and fodder crops. They are called wire-worms 'from their likeness in toughness and shape to a piece of wire'; they are yellowish in colour, from $\frac{1}{4}$ to $\frac{1}{2}$ an inch in length, with three pairs of legs, and a suctorial appendage below the tail. The adults are skip-jack or click beetles common in the fields in summer-time. The eggs are laid near the roots of plants, in the ground or in the axils of basal leaves; the grub remains for several years (three to five) as such, burrowing

in the ground during the frost of winter, but at other times hardly ceasing from voracious attacks on the roots and underground stems of all sorts of crops. Eventually they pupate in the soil, whence the adult beetle emerges. Common forms are *Agriotes obscurus*, *A. lineatus*, *A. sputator*. Of some sixty kinds of wire-worms (not to be confused with millipedes), only a very few are really detrimental. Preventives are lime-compost, guano and superphosphate, soot, nitrate of soda and salt, and other obnoxious dressings, summer fallow, and burning all rubbish, clod-crushing and heavy rolling. On a small scale slices of potatoes or turnips may be successfully used as traps. Among natural enemies of wire-worms moles, rooks, plovers, and pheasants are important.



Wire-worm:
a, perfect insect magnified; *b*, natural size of perfect insect; *c*, wire-worm magnified; *d*, natural size of wire-worm.

Wirth, KARL JOSEPH (b. 1879), German statesman, born at Freiburg (Baden), the son of a working engineer, was educated at Freiburg University. A professor for a time, he turned to politics in 1913. He was minister of finance of Baden in 1918, and of the republic in 1920, and retained that appointment with the chancellorship in the ministry which he formed in 1921 on the occasion of the Allied ultimatum regarding the payment of war reparations under the Treaty of Versailles; by the ultimatum the occupation of the Ruhr valley was threatened, and the reparation terms put forward (subsequently they had to be modified) were accepted. Later, in 1921, Wirth temporary withdrew from office, and in November 1922, largely on account of party dissensions, he resigned.

Wisbech, a town of the Isle of Ely, on the Nen, 21 miles ENE. of Peterborough, 13 SW. of Lynn, and 40 N. of Cambridge. The parish church, Norman to Perpendicular in style, has a fine tower; and there are a cattle-market (1811), a corn exchange (1857), a town-hall (1873), the Cambridgeshire hospital (1873), a museum and literary institute, and a public park of 18 acres. A castle, founded by the Conqueror in 1071, was rebuilt by Bishop Morton in 1483, restored by Bishop Andrewes in 1617, and again rebuilt from Inigo Jones's designs by Thurloe, Cromwell's secretary, but was demolished in 1816. Visited by King John and Edward IV., it was the prison under Elizabeth of many Catholic recusants, including Bishops Wishart and Watson, the Jesuit Weston, Dr Bagshaw, Catesby, and Tresham (T. G. Law's *Conflicts between Jesuits and Seculars*, 1890). Godwin was a native, as was also Clarkson, to whose memory a Gothic Cross by Sir G. G. Scott was erected in 1881. Vessels of nearly 750 tons can now ascend the Nen from the Wash (7 miles); and Wisbech exports cereals, imports timber, and is noted for its fruit-growing. It was long famous for its woad, and woad is still made here for dyeing. It was made a municipal borough in Edward VI.'s reign. Pop. 11,000

Wisby. See VISBY.

Wisconsin, twenty-fifth in area, and thirteenth in population of the United States, lies between Lakes Michigan and Superior and the Mississippi River, with its tributary the St Croix; it is a north central state, the surrounding states being Michigan, Minnesota, Iowa, and Illinois. Its length is about 300 miles and its breadth 250, with an area of 56,066 sq. m., including 810 sq. m. of inland water. The surface is a rolling plain with an elevation of 600 feet, rising to 1800 feet at the divide, about 30 miles south of Lake Superior. The general slope is south-westward towards the Mississippi, into which four-fifths of the streams flow. The principal of these are the Chippewa, the Black, and the Wisconsin, which furnish abundant water-power. The Fox, which occupies part of the same valley with the Wisconsin, flows north-eastward into Green Bay. It also passes through Lake Winnebago, the largest lake entirely within the state (28 miles by 10). There are over two thousand small lakes, often with picturesque outlets through narrow rocky gorges called 'dells,' or in the north forming rapids or cascades. These lakes are a striking proof of extensive glacial action, and a range of hills, the Kettle moraine, marks the edge of the enormous bed of ice which once covered all the state except the south-western part, called by geologists the 'driftless area.' The Archæan rocks of the northern part of the state testify that this was the oldest part of the continent. Next come the Huronian rocks, containing valuable beds of iron ore, and intermixed in the north-west with the copper-bearing formation of Lake Superior. To the south are sandstone and limestone formations, furnishing excellent building material, and in the south-west containing lead and zinc ores. Dense forests, consisting chiefly of white pine and other coniferous trees, but having also oaks and other deciduous trees, once covered most of the state except the prairie land in the south. Lumbering, however, without sufficient thought of reforestation has all but ruined the timber resources of the state. The average annual temperature of the state is 44° F.

The chief industry in the state is agriculture, the proportion of tenant-owners being very great. The principal crops are wheat, corn, rye, oats, barley, hemp, peas, sugar-beet, potatoes, tobacco, and fruit. Wisconsin is the chief dairy state of the union, and has important butter, cheese, and condensed milk industries. Lumbering is still an industry of great value, and is connected with numerous others—manufacture of furniture, paper and wood-pulp, automobiles, wagons, agricultural implements, &c. Zinc, iron-ore, limestone, lead, and cement are the chief mineral products. Miscellaneous industries are the manufacture of iron goods, textiles, and leather, flour-milling, sugar-refining, and the making of cigar-wrappers. The lake fisheries, especially whitefish, are of some consequence. Railway mileage for the state is over 8000 miles. Wisconsin is divided into seventy-one counties, and sends eleven representatives to congress. Education at all stages is liberally supported. The state possesses normal schools, an excellent system of public schools, and, at Madison, the University of Wisconsin (1848) with over 8000 regular students. The state capital is Madison, the leading commercial city Milwaukee. Other cities are Racine, Kenosha, Superior (with extensive docks), Oshkosh, Green Bay, Sheboygan, Lacrosse.

Artificial earth-mounds (see MOUND BUILDERS), some in the form of animals, as the turtle and buffalo, are the earliest works of man in Wisconsin. Jean Nicollet was the first white man who visited the state, having entered the Fox River region in 1634. In 1665 a Jesuit mission was founded on Green Bay, and French fur-traders soon established trading-posts. Upon the conquest of Canada in 1763 Wisconsin passed under British control, but

after the War of Independence sovereignty was transferred to the United States in the treaty of Paris (1783), effective occupation, however, not taking place till 1816. Wisconsin Territory, when formed in 1836, extended as far as the Dakotas; but in 1838 the Mississippi was made its western boundary. Ten years later it was admitted as a state. Special efforts were made to attract immigration by the offer of cheap lands, and the result has been an unusually large foreign element in the population—chiefly German and Scandinavian, but including also French and Swiss. Many of these foreigners settled in communities, which have tenaciously preserved their original language and customs. Roman Catholics form the most numerous religious body, followed successively by Lutherans, Methodists, Congregationalists, and Baptists. Pop. (1850) 305,391; (1880) 1,315,477; (1900) 2,069,042; (1920) 2,632,067. Indian reservations have a population of 11,000. In 1920 about 17·5 per cent.—460,128—were foreign-born, including 151,250 Germans and 68,000 Scandinavians.

Wisconsin, a river of Wisconsin, rises on the northern frontier, and flows nearly 600 miles south and west to the Mississippi. It is broken by many rapids and falls, but is navigable to Portage, about 200 miles from its mouth.

Wisdom, Book of. See Ecclesiasticus, Solomon.

Wiseman, Nicholas Patrick Stephen, cardinal and Roman Catholic archbishop of Westminster, was born 2d August 1802, at Seville, of an Irish family settled in Spain. He was brought to Ireland in his childhood, and received his first education at Waterford, whence he was removed to the Roman Catholic college at Ushaw, near Durham. In his sixteenth year he entered the English College at Rome, graduated doctor of divinity in 1824, was ordained priest in 1825, and in 1827 was made vice-rector of the English College. In 1828 he published his *Horæ Syriacæ*, and became rector. As such in Rome he delivered his *Lectures on the Connexion between Science and Revealed Religion* (1836); in London he first became known by a series of lectures on *The Doctrines and Practices of the Catholic Church* (1836). In the same year he was mainly instrumental in establishing the *Dublin Review*. In 1840 he was named coadjutor vicar-apostolic of the central district of England, with the title of bishop of Melipotamus *in partibus*, and appointed president of St Mary's College at Oscott. In 1846 he was transferred as coadjutor vicar-apostolic to the London district. From shortly after the Reformation the Roman Catholic Church in England had resorted to the expedient of a system of bishops *In Partibus Infidelium* (q.v.), with the title and authority of vicar-apostolic (see Vicar); but from the date of the passing of the Catholic Emancipation Act a desire had gradually sprung up among Catholics for the restoration of the normal form of church government by the establishment of a regular hierarchy. This measure was finally determined on by the pope in the year 1850, and Dr Wiseman was named archbishop of the see of Westminster, being at the same time created cardinal. This measure called forth a storm of religious excitement, which led to the passing of the futile Ecclesiastical Titles Act (q.v.). During the excitement Wiseman published an explanatory address of great ability and moderation entitled *An Appeal to the Reason and Good Feeling of the English People on the Subject of Catholic Hierarchy.* Notwithstanding these unfavourable circumstances, the undoubted abilities and literary eminence of Cardinal Wiseman eventually compelled the admiration of the British public. He took frequent occasion, moreover, by public lectures and addresses on the neutral subjects of education, literature, and art, to identify himself with the spirit of progress, and with the national sentiments of his fellow-countrymen; and in spite of failing health he published a succession of works which possessed much congenial to the sympathies of all cultivated Englishmen. The *Lectures on Science and Revealed Religion* already referred to; the lecture on the *Connexion between the Arts of Design and the Arts of Production;* on the *Influence of Words on Thought and Civilization;* on the *Points of Contact between Science and Art; Recollections of the Last Four Popes* (1858), and other similar works, obtained an extensive circulation. He died in London, 15th February 1865. He was a scholar of rare and various attainments, a distinguished orator, a graceful and vigorous writer, and an accomplished critic. In addition to the works mentioned above, he published *The Real Presence in the Eucharist* (1836); *Reply to Dr Turton on the Eucharist* (1839); *Lectures on the Offices and Ceremonies of Holy Week* (1839); *Essays on Various Subjects* (3 vols. 1853); *Fabiola, or the Church of the Catacombs* (1854), a singularly life-like picture of early Christian life in classic Rome; *Sermons* (2 vols. 1864); with many polemical tracts and other short publications. In 1866 appeared *The Witch of Rosenberg, a Drama in Three Acts;* and *Daily Meditations* in 1868. See the Lives by G. White (1865) and by Wilfrid Ward (2 vols. 1897).

Wiseman, Richard (born between 1621 and 1623, died 1676), surgeon to Charles II. See Surgery; and the monograph by Sir T. Longmore (1891).

Wishart, George, Scottish reformer, was born, it is supposed, about 1513. He belonged to the family of Pittarrow in Kincardineshire. Though so well-known a figure in Scottish history, few facts of his life have come down to us. In 1538 he was acting as schoolmaster in Montrose, where he incurred a charge of heresy for teaching the Greek New Testament. The following year we find him in Bristol, and again in connection with heresy, of which he had to make public abjuration in the church of St Nicholas in that city. The next few years he spent on the Continent, chiefly in Germany and Switzerland, a memorial of which sojourn is his translation of *The Confession of Faith of the Churches of Switzerland.* In 1543 he was residing in Corpus Christi College, Cambridge, where he had as one of his students Emery Tylney, who has described his tutor as 'a man of tall stature, polde headed, and on the same a round French cap of the best; judged of melancholy complexion by his physiognomie; blacke-haired, long-bearded, comely of personage, well spoken after his countrey of Scotland; courteous, lowly, lovely, glad to teach, desirous to learne, and was well travailed.' Sometime in 1543 Wishart is believed to have returned to Scotland, and it is after this date that his two years' career as a reformer begins; the story is told by Knox in his most graphic style. With an enthusiasm and eloquence which filled Knox with admiration, Wishart preached the Lutheran doctrine of justification by faith as opposed to the Catholic doctrine of good works, wherever he could gather a congregation to listen to him. His chief centre was Dundee, though he also found many supporters in Montrose, in Ayrshire, and East Lothian. At this period Cardinal Beaton was supreme in the councils of the nation. Through the schemes of Henry VIII., heresy in Scotland had inevitably assumed a political character, the friends of the new religion looking to England as their strongest ally, while the supporters

of the old church as naturally looked to France. Both as a churchman and as a politician, therefore, Beaton sought Wishart's death, nor did he wait long before compassing his end. At his instance Wishart was arrested at Ormiston in December 1545, and hanged and burnt at St Andrews on the 1st March 1546. Three months later Beaton was himself assassinated, his death being undoubtedly in some part due to his merciless dealings with Wishart. After Knox and Andrew Melville, Wishart is the most outstanding figure among the Scottish reformers of the 16th century. By his own labours as a preacher, the tragic manner of his death, by the fact that Knox was first inspired by his teaching and influence, he is to be regarded as one of the leading agents of the Reformation in Scotland.

See David Laing, *Works of John Knox* (vols. i. and vi.); Lorimer, *Precursors of the Reformation;* Dr C. Rogers, *Life of Wishart* (Edin. 1876); Tytler, *History of Scotland* (vol. iii.); Maxwell, *Old Dundee* (1891). In the last two books, as in many others, the question is discussed whether Wishart was a Scotsman of that name who was concerned in a proposal made to Henry VIII. for the assassination of Cardinal Beaton. So far no satisfactory decision has been given.

Wishaw, a thriving town of Lanarkshire, 3½ miles ESE. of Motherwell and 15 of Glasgow. Founded in 1794, it was constituted a police-burgh in 1855, and from 1874 comprised also the villages of Cambusnethan (Lockhart's birthplace) and Craigneuk. In 1920 it united with Motherwell (q.v.). Coal-mining is the staple industry, and there are also ironworks. Pop. (1881) 13,112; (1891) 15,252; (1901) 20,873; (1911) 25,263.

Wislicenus, Johannes (1835–1902), chemist, born near Querfurt in Prussian Saxony, taught chemistry at Harvard, New York, Zürich, and Würzburg, and in 1885 went to Leipzig as professor. He did important work in connection with the atomic theory, alcohols, and acids, and edited a handbook of chemistry.

Wismar, the second seaport of Mecklenburg-Schwerin, on the Baltic, at the head of a bay of the same name, 20 miles by rail N. of Schwerin. It has an excellent harbour, carries on an active oversea trade, and has varied manufactures. Of the walls only four gates remain; but the numerous quaint old houses are a feature of the place, and several of the brick churches date from the 14th and 15th centuries. The Fürstenhof, once a ducal residence, is of the middle of the 16th century. Wismar was a Hanse town in the 13th century, passed to Sweden in the peace of Westphalia (1648), was taken by the Danes in 1675, and by the Danes, Prussians, and Hanoverians in 1716, when its strong fortifications were destroyed, and in 1803 was pawned to Mecklenburg-Schwerin for 1,258,000 thalers, repayable within 100 years. On this ground it was unrepresented in the Mecklenburg Landtag till 1897, Sweden finally renouncing its claims in 1903. Pop. (1925) 26,016.

Wissembourg (German *Weissenburg*), a manufacturing town in Lower Alsace (Bas Rhin), is on the Lauter, 42 miles NNE. of Strassburg by rail. Pop. 5000. It grew up round a 7th-century Benedictine abbey and in 1677–97 was ceded to France. Here was fought, on the 4th August 1870, the first great battle of the Franco-German war, in which the Germans were victorious (see France). The Lines of Wissembourg, originally made by Villars in 1706, are famous—a line of works extending to Lauterberg 9 miles SE. Like the fortifications of the town, those of the lines have now disappeared.

Wistaria, a genus of Leguminosæ, having pinnate leaves and flowers in terminal racemes, the pod leathery. The species were formerly included in the genus Glycine. Some of them are amongst the most magnificent ornamental climbers known in British gardens. *W. speciosa*, a native of America from Virginia to Florida, found chiefly in marshy grounds, attains the height of 30 feet, and has beautiful racemes of fragrant bluish-purple

Wistaria chinensis.

flowers. A Chinese species, *W. multijuga*, is often seen in gardens on the Italian Lakes. *W. chinensis*, another native of China, has larger flowers in pendulous racemes, and its branches run to the length even of 90 feet. In Britain these plants are generally trained on walls.

Witch, or Craig-fluke (*Pleuronectes cynoglossus*). See Flat-fish, Fisheries.

Witchcraft, and the belief in it, rest on a view of the universe partly set forth under Animism, Demonology, Divination, Hell, Magic, Reincarnation, Vampire, Werwolf (compare Spiritualism, Theosophy); here it remains only to discuss the history of this, the most lamentable of human superstitions, as modified by Christianity, the causes of its extraordinary prevalence in the 14th, 15th, 16th, and 17th centuries, and of its gradual decay before the growing light of rationalism and the modern secularisation of the human intellect. A deeply rooted popular superstition adapts itself successively to every form of religious faith, and we soon find all the sorcery of the ancient heathen world imbedded in Christianity itself, and turned to new account in the popular conception of the function of the devil. The fundamental cause of belief in magical processes is the elemental confusion made by the primitive mind between subjective and objective relations, between the *post hoc* and the *propter hoc*, the scanty knowledge of natural causes being filled up with hypothetical causes of a metaphysical and supernatural character. To make the image of a thing is to reproduce it, and it is impossible to distinguish sharply between the visible representation of an object and its invisible and spiritual realisation. To burn an unpopular politician in effigy, to cherish a lock of hair of one we love, to reverence a Madonna and Child in our churches is not a whit more rational, or less irrational rather, than to torture an enemy by slowly burning his wax image or to raise a storm at sea by whipping a bucket of water with a switch. For to human nature in its ordinary conditions the symbol is necessary to any adequate or lasting realisation of the thing symbolised, and when once imperfect analogies and the confounding of the subjective and the objective are admitted, any perversity of imagination in the assumption of supra-sensible relations between things is intelligible enough. The symbolical is apt to be confused with the magical infliction of injury upon

an enemy in such Scripture instances as the arrows shot thrice by King Joash on the ground in order to smite the Syrians (2 Kings, xiii.15-18), and in the horns made by Zedekiah with which to push Syria (2 Chron. xviii. 10); while possibly a parallel may be drawn between the practice of making land barren with enchanted stones and one part of the ruin appointed for Moab (2 Kings, ii. 19-25).

We find then a belief in the possibility of sorcery everywhere in the ancient world—among the Chaldeans and the unimaginative Romans alike—and in Hebrew history the contest between Moses and the Hakhāmīm, or wise men of Egypt, suggests that wonders could be wrought by the *Elohim Acherim* or 'other gods.' The traditional contest between St Peter and Simon Magus in the earliest Christian times shows the same belief; and we find the Fathers all unanimous in this at least, that the fact of sorcery is supported by the strongest scriptural and ecclesiastical authority. The notion of a supreme embodiment of evil, at the head of the whole hierarchy of hell, from the beginning was embodied in Christian belief, and thus the whole human world came naturally to be regarded as ringed round with a countless host of malignant spirits whose work was none other than to thwart the divine purposes by leading men into the rebellion of sin. The ministry of Satan in the trial of Job, the werwolf-like transformation of Nebuchadrezzar, the necromancy of the Witch of Endor raising up the majestic shade of Samuel to pronounce the doom of Saul, the New Testament stories of demoniacal possession, and of the dispossessed devils entering into the Gadarene swine and rushing down a steep place with them into the sea—all these, superinduced upon the elemental belief in sorcery, went to form the Christian conception of witchcraft. Even a Scripture phrase like the 'prince of the power of the air' found only too literal an interpretation in the notion of the transportation of witches through the air to the unholy Sabbath. And of atmospheric phenomena, by a natural enough specialisation of functions, rain was usually left to God, rain with hail to his rival the devil. To obtain control over supernatural powers and lift the veil of the future has from the beginning been a dream dear to mankind, and everywhere has been believed to fall within the power of specially gifted men and women, often, as in the cases of the *evil eye* and *second-sight*, without any special desire for so peculiar a privilege. Certain natural objects and certain rites and observances had in themselves a mysterious power of producing certain effects, and the art of the sorcerer consisted in the knowledge of these mysterious powers and in the skill to combine and direct them to special purposes. Rhythmical incantations were effective in curing wounds and sickness, many in Presbyterian Scotland preserving traces of Roman Catholic ritual; and magical properties adhered to enchanted stones, wands like the rod of Moses and the *caduceus* of Mercury, engraved gems, amulets, horseshoes, moles' feet, mystic numbers, especially Seven (q.v.), animals as the toad and corbie, plants as the elder, thorn, hazel, and rowan—the first and last especially as antidotes to sorcery. To the rhymes of healing there were corresponding maledictions, 'devilish prayers'; and baneful powders were made from the dismembered bodies of the dead or from herbs with naturally baneful properties. The witches' pot of Olaus Magnus is reproduced in the witches' caldron on the blasted heath in *Macbeth*, and indeed the brewing of poisonous hell-broth and dangerous love-philtres is a characteristic occupation of witches everywhere, and explains the old confusion between poisoning and witchcraft from the Latin *veneficium*. Nor would a witch be scrupulous about building up by natural means a reputation for supernatural powers.

The higher kind of European magic in the middle ages was mixed up with what physical science there then was; and the most noted men of the time, like Roger Bacon and Cornelius Agrippa, were addicted to the pursuit, or were at least reputed to be so. So far from deriving his power from the kingdom of darkness, the scientific magician by the mere force of his art could compel the occasional services of the arch-fiend himself, and make the inferior demons the involuntary slaves of his will. But this allowable magic occupied but a small place compared with the illegitimate prostitution of such powers to the ends of evil, and thus sorcery came naturally to mean the unholy art of employing the artillery of hell against defenceless man—the Black Art proper. Satan moreover required human agents for his damnable purposes, and thus the whole life of man became a mere theatre whereon struggled countless hordes of devils, which to specially gifted eyes might sometimes be seen like a thick dust falling to the ground, or like motes in a sunbeam. Wier gives 72 princes and 7,405,925 inferior fiends, but as the astute Pierre de l'Ancre notes so precise a number could only have been communicated by Satan himself. The old heathen gods themselves came to be looked upon as devils with specialised functions—a theory we find imbedded in the demonology even of the *Paradise Lost*. St Augustine's treatise, *De Divinatione Dæmonum*, did much to formulate the orthodox opinion of Western Christianity on the subject, and in course of time the effects apparently produced by the intervention of the sorcerer were universally ascribed to the operations of the wicked angels who delighted to burlesque the divine methods and cause false dreams, visions, and prophetic inspirations, resembling in everything save their origin and their end those so often vouchsafed to the saints. Special personal compacts with the devil naturally came to be believed in, the individual, having the freedom of determining whether his own soul should be ultimately saved or lost, being able by a kind of *post-obit* bargain to purchase power and sensual gratification in this present world at the price of eternal damnation in the next. The literature of sorcery is full of such stories, from the 6th-century Theophilus (q.v.), saved through the special intervention of the Virgin, down to the awful fate of Dr Faustus which supplied a motive to two of the greatest modern masters of tragic art.

Apart from *obsession*, to which all men were liable, the actual fact of the *possession* of individuals, supported on such unexceptionable Scripture authority, was of course indisputable, and we find the power of casting out devils granted by Christ to his apostles continued in the church as a special grace. Pope Cornelius in the 3d century speaks of the Exorcists as a special order of the clergy, and the fourth Council of Carthage (396) prescribes a form for their ordination the same in substance as that given in the Roman *Pontifical* and used at the present day. There were six general symptoms of possession: barbarous and discordant screams, a fierce and horrid visage, numbness of the limbs, restlessness, unnatural strength, personal suffering—feeling the demons creeping like ants between the flesh and the skin, or like the pricking of needles. Speaking an untaught language was also held an infallible proof. The most effectual means of expulsion were holy water, consecrated wax, the *clangor campanarum*, and fumigation, which in *Tobit* is effectual in driving an obstinate Incubus from Ecbatana to Egypt. The exorcist first endeavours to fix the demon in the tongue, and

during the process he applies rue or relics to the demoniac's nose, the while provoking the demon to come out by opprobrious epithets. Some go forth as bees or ants, with a loud noise and hissing, others are imprisoned in a ring or phial, or escape in the body of some animal. It is often necessary to hold down the demoniac under water lest the fiend take refuge in his hair.

But, as regards sorcery, witchcraft, and compacts with the devil generally, many individual theologians and a whole series of provincial councils had pronounced such beliefs to be heathenish, sinful, and heretical, and even in Gratian's Decretal there was a canon requiring the clergy to teach the people that witchcraft was a delusion, and as such incompatible with Christian faith. Walter Map in the *De Nugis Curialium* (*c.* 1180–90) describes a sect, the Publicans or Paterines, practising abominable rites exceedingly like those attributed to the witches which traces 'its origin to those who have forsaken God.' By the command of King Henry II. they were 'branded and beaten with rods,' so that in England there were few to be found, and in Normandy and Brittany none at all. But it was not till after the establishment of the Inquisition in the beginning of the 13th century that witchcraft came fully to be recognised as falling within the province of the church—regarded simply as a correlative with heresy, both the work of the agencies of hell employed to pervert the faithful from the truth, and therefore to be punished with torture and the stake. The wide-spread social misery of the 11th and 12th centuries, the alarming spread of Catharist and Waldensian heresies, the terror of the Black Death which devastated the whole of western Europe in the 14th century, and its startling concomitants, the Flagellant and Dancing manias, had all contributed naturally to prepare men's minds for a conviction of the reality of Satanic agencies operating with fresh virulence in the world, and terror induced persecution, while in its turn persecution propagated terror. The general theories on the subject were early formulated by the Inquisitors, to whose leading questions alone may be attributed the substantial identity in the confessions made by thousands of poor distracted creatures racked by the agonies of torture, and the awful terrors of the stake and an eternity of hell. The stern injunction in the Mosaic law (Exodus, xxii. 18) was claimed as proof of the fact of witchcraft, and the obscure passage 'because of the angels' (1 Cor. xi. 10), together with that in Gen. vi. 2, was taken to establish the reality of the *Incubus*, a form of demon addicted to unclean commerce with women. Such inversions of nature as monachism and clerical celibacy generated all manner of notions as to the inherent pravity of women, in whom a morbid monkish imagination saw the favourite agents of the devil. And such a phantasy as Gautier's *Morte Amoureuse* may well have visited the imagination of many a virtuous monk as the revenge of nature against the struggle to attain a fictitious virtue. Demoniality or carnal connection with demons was a besetting snare to mediæval nuns, and Sprenger ascribes to nothing else the great 15th-century development of witchcraft. Aquinas is very strong upon the point; and were not the Huns known to be sprung from such connections?

Incubi and Succubi infested nuns and monks in turn, and sometimes had the devilish malice to assume the form of a holy man or woman and allow themselves to be caught in a compromising situation. To gratify lust, to obtain power to forecast the future, to gain wealth, to gratify enmity were the chief ends of all witchcraft, and the last embraced every form of evil which wicked ingenuity could devise. None of the devices of witchcraft was more persistent or distressing than the magic 'ligatures' which prevented the consummation of marriage. A belief in the reality of this was maintained by many provincial councils or synods and hundreds of bishops, and we are told how the father of Guibert de Nogent suffered the impediment for seven years, during which his wife magnanimously refused to avail herself of this pretext for a divorce. Nor against the dread of witchcraft was there any remedy; exorcism and the invocation of saints could avail only in demoniacal possession—for witchcraft the only cure was to get surcease from the devil through the intercession of other witches. The difficulty of the contrast between the illimitable power for evil of the witch and her helpless inability to save herself was explained by the fact that through the goodness of God the power of the witch left her as soon as she was seized by the officers of justice. Moreover, that power could be broken by drawing her blood 'above the breath,' or by employing in precaution the vervain, the mountain-ash, and the like, or the horseshoe over one's doorway. Her own state of wretchedness while enjoying immense power for evil over others was due to the radical faithlessness of the devil. The details of the witches' Sabbath varied very little throughout Europe, being for the most part a mere parody of the rites of divine service, eked out with wild dancing and sexual excesses. Sinclair (*Satan's Invisible World Discovered*, 1685) assures us that the devil often acted as piper, and taught many of those bawdy songs and their tunes unhappily so popular. Miss M. A. Murray (*The Witch-cult in Western Europe*, 1921) sees in all this a survival of an old religion in more or less veiled opposition to Christianity. In the leader of the local band, usually a man, the god was incarnate. He it is who appears in the records as the devil. The phallic rites in which he took part, and the general lascivious orgies of the male and female members of the coven, are those of a fertility cult though in its decay it applied mainly to the blasting of fertility the means appropriate to furthering it. This theory of a made-up stage devil enables much of the reported doings to be taken as matter of fact. Transformations into hare or cat may be accepted likewise if confusion be allowed between what the eye of the flesh saw and what the eye of faith. Broom-riding can be explained away. Animal familiars are more refractory. One of the especial tasks of the witch was the killing of unbaptised children, and many acted as midwives for no other purpose. The power of enduring torture was a special grace granted them by the devil, and other characteristic signs were crossing the legs, intertwining the fingers, women throwing their hair loose, walking backwards or contrary to the course of the sun (Scot. *widershins*), an inability to shed tears or repeat the Lord's Prayer, and especially the impression upon some part of the body of a secret mark imprinted by the devil at the Sabbath, when witches renounced their baptism and professed formally their submission. To discover this the prisoner was often shaved from head to foot, and subjected to horrible indecencies in the examination. This part was supposed to be insensible to pain, and one of the chief devices of the infamous 17th-century English witch-finder, Matthew Hopkins, was to prick the body of his victim all over until he found the spot. If his search was fruitless, he placed the witch cross-legged on a table in the middle of a closed room, with a hole in the door for the imps to enter by. In this manner she was kept for a day or even two days without sleep or food. Next she was walked up and down till her feet were blistered.

By this time confessions enough were mostly forthcoming; but if all this had failed she was flung into a pond with thumbs and toes tied together cross-wise, when if a witch it was impossible for her to sink. The value of the watery ordeal depended upon the fact that Satan, being very light, supported those that were his own. Their extraordinary levity was again seen when they were weighed in the scales against the Bible. But these English tortures were gentleness itself compared with the infamies habitual to the Inquisition, and not unknown to Scottish Presbyterianism. And even in Scotland, though witches were occasionally burned *quick*, they were usually strangled before the fire reached them. They are supposed to have been fastened to the stake with those witch-bridles examples of which exist.

As we have seen, it was not till towards the close of the 13th century that the Inquisition succeeded in including sorcery within its jurisdiction. Pope Alexander IV. launched the first papal bull against witchcraft in 1258. It was followed by a series of others, of which the most famous—or infamous—was the *Summis desiderantes affectibus* of Innocent VIII. (1484). The last papal bull was issued in 1631 by Urban VIII. For the black art these bulls initiated a veritable reign of terror. The earliest detailed account of witchcraft is found in Nider's *Formicarius* (1337), in which we can trace the development out of ordinary sorcery. The *Flagellum Hæreticorum Fascinariorum* of the Inquisitor Nicholaus Jaquerius (1458) already shows the Holy Office realising the need of a regular procedure, and this was at last given with much fullness in the infamous *Malleus Maleficarum* (1489), the work of the sincere fanatic Sprenger and his coadjutor, Krämer (Institor), who, armed with Pope Innocent's bull, traversed Germany, leaving behind them a track of blood and fire. The infection spread far and wide, and witches were no longer burned in twos and threes, but in scores and hundreds. In the small bishopric of Bamberg within three months 600 perished; in Würzburg, which is scarcely larger, 900; in Geneva, 500 (1515); in the district of Como, Bart. de Spina (*De Strigibus*) says over a hundred were burned every year; at Toulouse 400 perished together, and 50 at Douai in a single year; Nicholaus Remigius, a judge of Lorraine, boasts in 1597 that he had condemned 900 in fifteen years; the Archbishop of Trier avenged the coldness of the spring of 1586 upon 118 women and 2 men burned together. And his promptitude was well advised, for some of his victims on the way to their place of doom declared that with three more days they would have brought cold so intense as to destroy every green thing, and plunge the whole country into starvation. The Inquisition did its work effectively, for Paramo boasts that by 1404, within a century and a half of its foundation, it had burned at least 30,000 witches who, if left unchecked, could easily have brought the whole world to destruction. The charge of sorcery had been a prominent feature in the infamous trials of the Templars in France; the Maid of Orleans had been burned on this charge at Rouen in 1431 at the instance of the English, but by sentence of a French bishop; and these cases, with that of the Vaudois, or witches of Arras, of whom 34 were arrested and 12 burned (1460), were the most conspicuous examples of such processes before the identification between sorcery and heresy was complete, and the jurisdiction passed finally into the control of the Inquisition. The progress of the witchcraft epidemic had indeed not been rapid, and all three cases had aroused widespread public incredulity, while Joan's character was solemnly rehabilitated in 1456; and the Parlement finally in 1491 upset the Arras processes and sentences as unjust and excessive, ordered reparation to be made even to the dead in the shape of masses for their souls, and decreed that the cruel and unusual tortures employed should be prohibited for the future in all secular and ecclesiastical tribunals. Perhaps in consequence of all this the Inquisition made its way much slower in France than in Germany and Italy. But the most severe rebuff it experienced was from the republic of Venice, which had jealously preserved the secular jurisdiction over sorcery. Brescia had become specially infested by witches, and in 1510 as many as 70 men and 70 women were burned there; in 1514, 300 at Como; while it was currently reported that the Sabbath on the plain of Tonale near Brescia was attended by 25,000; and finally in 1518 the senate was informed that the inquisitor had burned 70 witches of the Valcamonica, that he had as many more in his prisons, and that those suspected or accused amounted to about 5000, or one-fourth of the population of the valleys. The Signoria at once interposed its veto, and even the fiery bull of Leo X., *Honestis* (1521), could not force its outraged sense into submission.

The Reformation of the 16th century made no change in the popular view of witchcraft, which, indeed, rather rose to a height during the 17th century. Theologians of all confessions believed in the possibility and reality of compacts with the devil as strongly as they believed in the dogma of the personality of the devil itself. Erasmus and Luther were equally strong believers in witchcraft, and the latter realised the active interference of the devil as few men have done in any age. Catholic and Protestant theologians alike defended the prosecutions; on the one side, Jean Bodin, Peter Binsfeld, and the Jesuit Martin Delrio; on the other, the Heidelberg physician Thomas Erastus, King James I. of England, and the famous criminal lawyer Carpzov of Leipzig. But in spite of this array of learning, and the vast preponderance alike of clerical and lay opinion, there had not been wanting a succession of honest doubt, whether from natural scepticism or from humanity. Johann Wier (q.v.), a physician, by his famous work, *De Præstigiis Dæmonum* (1564), and its complements, *De Lamiis* and *Pseudo-monarchia Dæmonum* (appended as a sixth chapter to the 1577 edition), has left a name imperishable among the benefactors of humanity. His scepticism was not too strong, but he went as far as he durst, and evidently meant to imply more than he dared say. The reply of the famous political philosopher, Jean Bodin, *De Magorum Dæmonomania* (1579), is mainly an indignant and completely credulous appeal to authority—to universal law, the Scriptures, and the Fathers. The great work of the enlightened Englishman, Reginald Scot, *The Discoverie of Witchcraft*, followed in 1584, and stands alone, more than a century before its time, as a full and outspoken appeal to reason and to humanity against a puerile and cruel superstition. Montaigne in his essay 'Of Cripples' (1588), with regard to this question, strikes the fundamental note of modern rationalism, and adds with exquisite irony, 'after all, it is setting a high value on our conjectures to roast a man alive on account of them.'

Yet it was only very gradually that the superstition gave way. Nicholaus Remigius published his *Dæmonolatria* in 1595, the Jesuit Martin Delrio his erudite and ponderous *Disquisitiones Magicæ* in 1599. But two Jesuits may also be counted among the earliest enemies of the superstition, Adam Tanner (1572–1632) and Friedrich Spee, whose *Cautio Criminalis, seu de Processibus contra Sagas* (1631), was an appeal for more circumspection in the trials, the author having

been present at many of these in the dioceses of Würzburg and Bamberg, and having come to the conclusion that many of the victims were entirely innocent. He advances no less than fifty-two doubts, and his conclusion is that there is so much difficulty in such cases that processes should be suspended. He dared not put his name to his work, and could print it only in a Protestant town, Rinteln. The Dutch Protestant Balthasar Bekker, in his curious work *De Betoverde Wereld* (1691–93), expresses openly a strong disbelief in sorcery, magic, possession by the devil, and even the existence of the devil himself. He was deposed and excommunicated for his temerity. The great Halle jurist, Christian Thomasius, published in 1701 a masterly tract, *Theses de Crimine Magiæ*, which did much to educate the public opinion of Germany. But the devil did not give way before the philosophers without a struggle. There was a great outburst of lycanthropy in the later half of the 16th century in southern France, the most interesting trial being that of Gilles Garnier at Dôle in 1573. The provincial Parlements of Paris, Rouen, Reims, and Bordeaux enacted stringent decrees against all forms of witchcraft, and the cases of some of their victims give reason to suspect the real guilt of toxological practices, thus reviving the full signification of the ancient *veneficus*. The Parlement of Bordeaux appointed a commission to inquire into the causes of the prevalence of witchcraft in the Basque provinces, and these remain to the curious in the work of Pierre de l'Ancre, one of the most interesting of its class, *Tableau de l'Inconstance des Mauvais Anges et Démons* (1612). He found the whole population of the Labourd infected with witchcraft—the men, the women, and even the priests and children, as many as 2000 of the last alone flocking nightly to the Sabbath. He sees a singular affinity between tobacco and sorcery, and finds a special significance in the Basque fondness for the apple, the fruit of transgression; but the real reason why women are naturally so much more prone to sorcery than men he thinks most probably a secret wrapped up in the inscrutable wisdom of God. Another phase of witchcraft rife in France during the 17th century was demoniacal possession, and this reached its height in the strange convulsions of the Ursuline nuns of Sainte-Baume near Aix, and the abominable immoralities of their corrupter Louis Gauffridi, burned alive deservedly in 1611; in the famous case of Urban Grandier (burned 1634) and the nuns of Loudun in Poitou; and in the ecstatic trances of Madeleine Bavent and her guilty relations with her abandoned confessor at the convent of Louviers (1635–47). These unedifying histories of lust and cruelty may be read in the glowing pages of Michelet, *La Sorcière* (2d ed. 1862). In the same century the fires of persecution raged hotly in Bamberg and Würzburg, as many as 900 trials having taken place in the reign of the prince-bishop John George II., in the two courts of Bamberg and Zeil between 1625 and 1630, and 600 are supposed to have been burned, so little care being taken that the accused are not enumerated by name, but merely cited as No. 1, 2, 3, and so on. Under Bishop Philipp Adolf, who came to the see of Würzburg in 1623, a great confederacy of sorcerers was quickly discovered, and during two or three years hundreds of persons of all ages and conditions, children of ten and twelve years old, vicars, canons, students, together with 'Göbel's child, the most beautiful girl in Würzburg,' were hurried to the stake. The ghastly catalogue of these victims in twenty-nine burnings is printed in Hauber's *Bibliotheca Magica*, and reprinted in Thomas Wright's excellent *Narratives of Sorcery and Magic* (2 vols. 1851). A great epidemic of witchcraft broke out in the village of Mohra in Sweden in 1669, and a commission of clergy and laymen appointed by the king examined as many as 300 children, and found a singular unanimity in the confession of particulars. Seventy persons were condemned to death, 15 being children, while 36 more between nine and sixteen were forced 'to run the gantlet,' and 20 more were whipped every Sunday for a year. See the account by Anthony Horneck, D.D., appended to Glanvill's *Collection of Relations*.

Lea showed that in Spain witch cases were referred to the ordinary process of the Holy Office, which almost invariably rejected the evidence as wholly insufficient. In 1672 we find Colbert directing the magistrates in France to receive no accusations of sorcery and commuting sentences of death into banishment, an indulgence against which the Parlement of Rouen protested as dishonouring to God and Christian tradition. The most remarkable trial for sorcery at this period was that of the Marshal of Luxembourg in 1681, and we find in the last two decades of the century only seven sorcerers burned in France. Yet the Parlement of Bordeaux burned a man as a *noueur d'aiguillettes* in 1718; and in spite of all the boasted illumination of the 18th century an old nun was burned as a witch at Würzburg in 1749. In the year 1754 a girl of thirteen, and in 1756 another of fourteen, were put to death at Landshut on suspicion of witchcraft. A servant-girl at Glarus in German Switzerland in 1782 was the latest judicial victim in Europe—the last of 300,000 women who are computed to have perished since the promulgation of the bull of Innocent VIII. Within the range of Catholicism, so late as 20th August 1877, five witches were burned alive by the Alcalde Ignacio Castello of San Jacobo in Mexico, 'with consent of the whole population.' In 1926 a number of men and women were tried at Melun in France for assaulting a priest, who, they said, inflicted death and disease by his spells transmitted by birds, and by sticking pins in images.

England was long preserved from the infection of regular persecutions for witchcraft, the first formal enactment declaring it a felony dating only from 1541. Besides, torture was naturally repellent to the national spirit, and without systematic torture and leading questions such prosecutions could not thrive. At the same time there had been ever since the Conquest occasional trials for sorcery, and victims had been burned by the king's writ *De Hæretico comburendo*, after condemnation in the ecclesiastical courts. The Act of 1541 was supplemented by another under Elizabeth in 1562, and in the first year of James I. was passed the law which continued in force for over a hundred years. Its most important section ran as follows: 'If any person or persons shall use, practise, or exercise any invocation or conjuration of any evil and wicked spirit, or shall consult, covenant with, entertain, employ, feed, or reward any evil and wicked spirit to or for any intent or purpose, or take up any dead man, woman, or child out of his, her, or their grave or any other place where the dead body resteth, or the skin, bone, or any part of any dead person, to be employed or used in any manner of witchcraft, sorcery, charm, or enchantment, or shall use, practise, or exercise any witchcraft, enchantment, charm, or sorcery, whereby any person shall be killed, destroyed, wasted, consumed, pined, or lamed in his or her body or any part thereof,' every such offender is a felon without benefit of clergy. We find in earlier days sorcery regarded with a kind of vague dread, heard of occasionally in such cases (in large part political) as those of Dame Alice Kyteler of Kilkenny, who saved herself only by flight in 1324, leaving her obscurer accomplices to perish; the

Duchess of Gloucester, who did public penance and was imprisoned at Chester, while her secretary was hanged and her accomplice, the celebrated Witch of Eye, Margery Jourdemayne, burned (1441); and Jane Shore; but the wisdom of the Modern Solomon brought a knowledge of it down to everyday village life, and what had heretofore in England caused but occasional local mischief now became a virulent epidemic frenzy. In Cranmer's 'Articles of Visitation' (1549) an injunction is addressed to the clergy, that 'you shall inquire whether you know of any that use charms, sorcery, enchantments, witchcraft, soothsaying, or any like craft invented by the devil.' Strype tells us Bishop Jewell, preaching before the queen in 1558, said: 'It may please your Grace to understand that witches and sorcerers, within these last few years, are marvellously increased within your Grace's realm. Your Grace's subjects pine away even to the death, their colour fadeth, their flesh rotteth, their speech is benumbed, their senses are bereft. I pray God they never practise further than upon the subject.' Reginald Scot's protest fell unheeded, or rather roused the king to write his *Dæmonologie* (1597), which was ostensibly aimed against the 'damnable opinions of Wierus and Scot, the latter of whom is not ashamed in public print to deny there can be such a thing as witchcraft.' In Lancashire especially there was found to be a deplorable increase of witches; in 1612 fifteen were indicted at Lancaster and twelve condemned, and in 1634 seventeen Pendle Forest witches were condemned on the evidence of one boy, who was fortunately discovered to be an impostor. Under the Commonwealth there was a great increase of persecution, and especially in the Puritan eastern counties. The infamous 'Witch-finder General' Matthew Hopkins pricked, waked, and swam hundreds of unhappy women in Essex, Suffolk, Norfolk, and Huntingdonshire, carrying with him an assistant and a female searcher, and charging twenty shillings expenses in every town he visited. Hopkins caused to be hanged sixty in one year (1644) in Essex, and [Bishop] Hutchinson in his reliable *Essay on Witchcraft* (1718) enumerates sixteen executions at Yarmouth in 1644, fifteen in Essex in 1645, nearly forty at Bury St Edmunds in 1645–46—among these last 'an old reading parson,' John Lowes, who had been for nearly fifty years vicar of Brandeston in Suffolk, and who under torture confessed to having employed two imps to sink a ship. Baxter in his *Certainty of the Worlds of Spirits* (1691) tells with approval this pitiful story, and elsewhere we are told how the old man read the burial-service for himself just before his execution. John Gaule, vicar of Great Staughton, published his *Select Cases of Conscience touching Witches and Witchcraft* (1646), attacking the methods of Hopkins, and it is a satisfaction to find that there is every probability Hopkins was himself swum and hanged in 1647. One of the most striking cases occurred in 1664, when the enlightened Sir Matthew Hale tried and condemned two women, Amy Duny and Rose Cullender, at Bury St Edmunds, for bewitching children, the opinion of Sir Thomas Browne, who was present, telling with great weight against the prisoners. Chief-justices North and Holt were the first in high places who had the good sense and the courage to set their faces against the continuance of this delusion, and to expose the general absurdity of such charges. Jane Wenham was convicted at Hereford in 1712, but not executed, and another woman is recorded to have been tried in Leicester in 1717.

But popular beliefs die hard, and we find assaults upon alleged witches in England continuing to the present day. We have seen Sir Thomas Browne's and Baxter's conviction of the reality of witchcraft, and we find Selden, with characteristic caution, recommending that witches should be hanged for their malignant intentions at any rate. Three books which deserve to be named in the roll of honour as outspoken appeals to humanity and sense are *A Candle in the Dark*, by Thomas Ady (1655), *The Question of Witchcraft Debated*, published anonymously by John Wagstaffe (1669), and *The Displaying of Supposed Witchcraft* (1677), by John Webster, a work of singular vigour and ability. Hobbes was sceptical on the matter, but the philosophical Glanvill in his famous *Sadducismus Triumphatus* (1681) made a bold attempt to buttress the already decaying belief, maintaining that Atheism grew out of Sadducism, and that witches once disproved, all spiritual existence disappeared with them. More and Cudworth approved the book, and even so late as 1768 John Wesley repeated the same argument: 'It is true likewise that the English in general, and indeed most of the men of learning in Europe, have given up all accounts of witches and apparitions as mere old wives' fables. I am sorry for it, and I willingly take this opportunity of entering my solemn protest against this violent compliment which so many that believe the Bible pay to those who do not believe it. I owe them no such service. I take knowledge that these are at the bottom of the outcry which has been raised, and with such insolence spread through the land in direct opposition not only to the Bible, but to the suffrage of the wisest and best of men in all ages and nations. They well know (whether Christians know it or not) that the giving up witchcraft is in effect giving up the Bible.' Even in 1927 we find a scholarly writer, Mr Montague Summers, in his *History of Witchcraft and Demonology*, taking his stand not far from the position of the orthodox of the 16th century.

Nowhere were the witchcraft trials more cruel than in Scotland, where the clergy controlled the whole social life, and an iron theology dominated the imaginations of men; the more vividly the torments of hell are realised the more callous do men ever become to human sufferings in this world. We find the Scottish clergy throughout the leading managers of the prosecutions, before whom the confessions were taken and the tortures inflicted. The ministers and kirk sessions were required to make strict inquisition, and private accusations were invited even from the pulpit. There is but little account of sorcery in the earliest Scottish records, scarce anything in Fordun, but enough in Wyntoun, and ample store also in the *Breviary of Aberdeen* (1510). The statute of 1563 was the first regular enactment, and the earliest conviction is supposed to have been that in 1479 for consuming a waxen image of the king. Yet comparatively early we find it occasionally ascribed to persons of high estate. Sir Michael Scott of Balwearie, and William, Lord Soulis of Hermitage Castle, who was boiled to death, were notable sorcerers; Janet Douglas, Lady Glammis, was executed under James V. (1537) for devising the death of the king by poison or witchcraft; John Knox mentions the Countess of Huntly as a notable patroness of witches, and himself was supposed to have gained the affections of Lord Ochiltree's youthful daughter by sorcery; Catherine Ross, Lady Fowllis, only escaped with difficulty on a charge of sorcery in 1590; and the Earl of Gowrie of the mysterious conspiracy was a master of magic, the word *Tetragrammaton*, found written in parchment on his body, preventing the blood flowing even when he was dead. Some ten years earlier a vast hellish conspiracy was formed near

Edinburgh to drown King James VI. on his voyage from Denmark. It centred round Doctor Fian, *alias* John Cunningham, master of the school at Saltpans in Lothian, and Agnes Sampson, the 'Wise Woman of Keith' (Haddingtonshire), whom Archbishop Spottiswoode describes as 'a woman not of the base and ignorant sort of witches, but matronlike, grave, and settled in her answers, which were all to some purpose.' Fian's nails were torn from his fingers, and his legs were crushed by the boot till the marrow was squeezed out of the bones, and finally, in January 1591, he ended his sufferings in the fire. The confessions of the woman told how as many as two hundred witches had flocked to the kirk of North Berwick, where the devil preached damnable blasphemies and denunciations of the king, and made all the witches kiss his buttocks over the pulpit. According to Miss Murray, the devil in this case was Francis, Earl of Bothwell (nephew of Queen Mary's husband). Dr W. Ramesey in his *Elminthologia* (1688) tells us he saw nine witches burning together on Leith Links in 1644, and about 1650 we hear of John Kincaid of Tranent, especially skilful as a pricker, using pins about three inches in length. We read in Pitcairn how Alesoun Balfour was burned at Kirkwall in 1596, after being tormented with the *caschielawis* for forty-eight hours, her aged husband before her eyes bound in the *lang irnis* of fifty stone weight, her son tortured with the *boot* to the extent of fifty-seven strokes, her daughter, but seven years old, put in the *pillie-winkis* (thumbscrews). The Restoration set the witch-fires ablaze with greater fury than ever, ignorant justices abetted by frenzied ministers sentencing all delated to them. As many as fifty commissions from the Privy-council to individuals of certain districts to hold trials, each with the names of from one to ten delinquents, were issued within eight months from January 1662, and these distinct from the ordinary Court of Justiciary, Sheriffs, and Bailies of Regalities. One of the most striking cases was that of Isobel Gowdie of Auldearn, burned in 1662 after a series of confessions of unusual imaginativeness, printed in full by the painstaking Pitcairn. This small district contained at that time so many witches that Satan, for convenience, was obliged to divide them into companies of thirteen, called *covines*, as was done apparently elsewhere. Major Weir was strangled and burned at Edinburgh in 1670 for sorcery and incest; his sister Jean, who confessed to intercourse with evil spirits, and employed a familiar to spin her lint, was hanged the day after. In 1662 there was a great outburst of witchcraft at Inverkip, Renfrewshire, where Marie Lamont, a girl of eighteen, made a series of remarkable confessions. In Renfrewshire also seven suffered in 1697 at Paisley for bewitching Christian Shaw, of Bargarran, a girl of eleven, who afterwards was the means of beginning the thread-manufacture in Paisley. Other more notable cases occurred also at Kinross (1718), Spott in East Lothian (1705), Pittenweem (1704); as well as the death through the use of a waxen figure of Sir George Maxwell of Pollock in 1677, for which five suffered at Paisley, and the obstinate bewitching of Lord Torphichen's son in 1720. The last execution in Scotland took place at Dornoch in 1722, where a poor old woman perished for having ridden her own daughter, transformed into a pony, and shod by the devil, which made the girl ever after lame, both in hands and feet, as well as her son after her. The weather was cold, and the old woman sat quietly warming herself by the fire prepared to burn her while the preparations were being made. Sir George Mackenzie (q.v.), who is not usually credited in Scotland with humanity, among other sensible and humane remarks on witchcraft, adds: 'Most of these poor creatures are tortured by their keepers, who, being persuaded they do God good service, think it their duty to vex and torment poor prisoners; and I know, *ex certissimâ scientiâ*, that most of all that ever were taken were tormented after this manner; and this usage was the ground of all their confession.' William Forbes, professor of law in Glasgow, declares his firm belief in witchcraft in his *Institutes of the Law of Scotland* (1730), defining it as 'that black art whereby strange and wonderful things are wrought by a power derived from the devil. . . . Nothing seems plainer to me than that there may be and have been witches, and that perhaps such are now actually existing; which I intend, God willing, to clear in a larger work concerning the criminal law.' The statutes against witchcraft were finally repealed in 1736, to the great displeasure of the leading seceders from the Church of Scotland, for we find enumerated, in the confession of national and personal sins printed in an act of the Associate Presbytery at Edinburgh in 1743, the act of Queen Anne's parliament tolerating Episcopacy in Scotland, the act for adjourning the Court of Session during the Christmas holidays, 'as also the penal statutes against witches having been repealed by parliament, contrary to the express law of God.

In Ireland the belief in witchcraft still proves its ghastly power from time to time. In 1895 a Tipperary man, Cleary, burnt his wife to death as one bewitched, and was sentenced at Clonmel (15th July) to twenty years' penal servitude; five others receiving a sentence for sharing in the crime.

Those who crossed the Atlantic for conscience sake carried all their superstitions with them, and we find an execution for witchcraft in New England as early as 1648, while in the abstract of the laws of that colony, printed in 1655, there stand these articles: 'Witchcraft, which is fellowship by covenant with a familiar spirit, to be punished with death. . . . Consulters with witches not to be tolerated, but either to be cut off by death or banishment, or other suitable punishment.' But the interest of American witchcraft centres in the famous Salem cases (1691–92), the guilt of which may in great measure be laid on the shoulders of Cotton Mather (q.v.), author of *Memorable Providences relating to Witchcraft and Possessions* (1685) and *Wonders of the Invisible World* (1692). Nineteen persons were executed, among the six men one clergyman and Giles Corey, a man over eighty, who, refusing to plead, was pressed to death. All died protesting their innocence, and even those who had been terrified into confession withdrew it, although their honesty cost them their lives. Nor were the victims here at least abandoned by their friends: in all the trials of this kind there is nothing so pathetic, says Lowell, as the picture of Jonathan Cary holding up the weary arms of his wife during her trial, and wiping away the sweat from her brow and the tears from her face. A reaction speedily set in, and, though in January 1693 three more were condemned, no more executions took place, and a few months after the governor discharged all the suspects from gaol, as many as 150 in number. One Samuel Parris, a clergyman who had been one of the main instigators of the prosecutions, confessed his error, but was dismissed by his flock in 1696, while even Cotton Mather acknowledged that there had been 'a going too far in that affair.' This lamentable story is told fully by Charles W. Upham in his *History of the Salem Delusion* (1831; new ed. 2 vols. 1867); see also Lowell in vol. ii. of *Literary Essays* (1890).

Many of the more important books on witchcraft have been mentioned incidentally in the foregoing pages; the names of all the older books will be found in Grässe's *Bibliotheca Magica* (Leip. 1843). A comprehensive

collection is that published at Frankfurt in 2 vols. 1582, containing the pertinent books of Sprenger, Nider, Basin, Molitor, the *Flagellum Dæmonum* compiled by Mengus, Gerson, Murner, Malleolus, and Bart. de Spina. Another is the *Theatrum de Veneficiis* (Frankfurt, 1586), containing seventeen tracts by Danæus, Lercheimer, Bullinger, Ewich, Trithemius, &c. Among general books the best accounts of the superstition will be found in Lecky's *History of Rationalism in Europe* (vol. i.), Tylor's *Primitive Culture*, and H. C. Lea's invaluable *History of the Inquisition of the Middle Ages* (vol. iii. 1887). Serviceable books are Thomas Wright's *Narratives of Sorcery and Magic* (2 vols. 1852); Ennemoser's *Geschichte der Magie* (Eng. trans. 1854); Maury, *La Magie et l'Astrologie* (1860); Garinet, *Histoire de la Magie en France* (1818); Heppe's edition of Soldan's *Geschichte der Hexenprocesse* (2 vols. 1880); Scott's *Letters on Demonology and Witchcraft* (1830); Grimm's *Deutsche Mythologie;* Howard Williams, *The Superstitions of Witchcraft* (1865); Roskoff's *Geschichte des Teufels* (1869); Conway's *Demonology and Devil Lore* (2 vols. 1878); Diefenbach, *Der Hexenwahn* (Mainz, 1886); W. H. Davenport Adams, *Witch, Warlock, and Magician* (1889); *Le Sabbat des Sorciers* (1882); Baissac, *Les Grands Jours de la Sorcellerie* (1890); Lorédan, *Un Grand Procès de Sorcellerie* (1912); C. G. Leland, *Gypsy Sorcery* (1891); Edmund Gurney, *Phantasms of the Living;* Notestein, *History of Witchcraft in England* (1911); Miss Murray, *Witch-cult in Western Europe* (1921); J. W. Wickwar, *Witchcraft and the Black Art* (1925); Montague Summers, *History of Witchcraft* (1927), *Geography of Witchcraft* (1927). An indispensable book for Scottish witchcraft is Pitcairn's *Criminal Trials in Scotland from 1484 to 1624* (4 vols. 1830–33), which may be supplemented by Wodrow's *Analecta*, and especially J. G. Dalyell's *Darker Superstitions of Scotland* (1834); J. H. Burton's *Criminal Trials in Scotland* (2 vols. 1852), C. K. Sharpe's edition of Law's *Memorialls* (1819), with introduction, itself reprinted as *The History of Witchcraft in Scotland* (1884), and J. G. Campbell, *Witchcraft and Second Sight in the Highlands and Islands* (1902). See also such folklore books as are really reliable, as those of Pitré, Krauss, Ralston, Mannhardt, &c.; and the articles ANIMISM, APPARITIONS, ASTROLOGY, DEMONOLOGY, DEVIL, DIVINATION, EVIL EYE, EXORCISM, FAIRIES, FAMILIAR, FAUST, INCANTATION, MAGIC, SPIRITUALISM, VAMPIRE, WERWOLF.

Witch-hazel (*Hamamelis virginica*), a North American shrub of the Hamamelidaceæ, a small family found in temperate and tropical Asia, in tropical Africa, and North America, but not in Europe; shrubs or small trees, with alternate, stipulate, feather-veined leaves, and small axillary unisexual flowers. The witch-hazel is a shrub or small tree 10 or 12 feet high. The leaves are 4 inches long and 2 or 3 broad; the flowers clustered, yellow and showy, with long linear petals appearing in the fall of the year, the fruit ripening in spring. The seeds contain a quantity of oil, and are wholesome and edible, while the leaves and bark are astringent, and the tincture is much used for piles, varicose veins, &c. The name is due to the supposed virtues of a forked twig as a divining-rod.

Witenagemót ('meeting of counsellors, *witena* being genitive plu. of the O.E. *wita*, 'a wise man,' 'a counsellor'), the great national council of England in Anglo-Saxon times, by which the king was supposed to be guided in all his main acts of government. Each kingdom had its own witenagemót before the union of the several kingdoms in 827, after which there was one for the whole country. It was composed of the bishops, the ealdormen of shires, and a number of the king's friends and dependents, the king's thanes (see THANE). It met frequently, if not at regular intervals, and claimed very extensive powers—which, however, varied inversely with the power of the prince. The witan deliberated on all new laws, made treaties, elected the king, and once deposed one (Ethelred II.), appointed bishops, assented to grants of land, with the king levied taxes, and formed a supreme court of justice. But, as it was a council of royal officers and territorial magnates, it is misleading to identify its functions with its successor, the representative House of Commons. See ENGLAND and PARLIAMENT, and works there cited, especially Stubbs and Freeman.

Wither, or WITHERS, GEORGE, poet and pamphleteer, was born at Bentworth, Hampshire, 11th June 1588. He was sent to Magdalen College, Oxford, but did not graduate, being called away after two years. At eighteen, however, he found his way to London, and entered at Lincoln's Inn, where he made fast friendship with William Browne (q.v.), then of the Inner Temple. For his *Abuses Stript and Whipt*, generally a very abstract satire indeed, with the refreshing dedication 'To Himselfe G. W. wisheth all happiness,' he found himself in 1613 in the Marshalsea, and here, in spite of harsh imprisonment, he wrote his *Shepherds Hunting*, a sweet pastoral, the fourth eclogue of which contains his famous verses on the consoling power of poetry to the poet. It is supposed that his satire addressed to the king (1614), together with the Earl of Pembroke's intercession, procured his release. The charming *Fidelia* seems in the first instance to have been printed for private circulation in 1617. In 1621 appeared *Wither's Motto: Nec habeo, nec careo, nec curo* ['I neither have, nor want, nor care'], a curious piece of self-confession, egotistical yet not distasteful, extending to two thousand lines. His *Fair Virtue, or the Mistress of Philarete* (1622, but probably a revision of earlier work), with the inequality of all he did, shows exquisite fancy and here and there pure inspiration. Thereafter his work consists of religious poetry and of controversial and political pamphlets. His *Hymns and Songs of the Church* (1623), set to music by Orlando Gibbons, were ordered in a royal patent to be compulsorily bound up with the authorised psalter, but conflict with the Stationers' Company and a general banning of his work resulted (Wither set out his grievances in *The Scholar's Purgatory*), and ultimately the privilege was disallowed. Wither was in London during the plague of 1625, and wrote two accounts (one *Britains Remembrancer*, 1628) of the event. In continuance of work in religious verse, *Psalms of David translated* appeared in 1632, *Emblems* in 1635, *Hallelujah* in 1641. By this time Wither had become a fiery Puritan, and in 1642 he sold his estate to raise a troop of horse for the parliament. He was taken prisoner, and is said to have owed his life to the intercession of Sir John Denham, who pleaded with much more wit than truth that, 'so long as Wither lived, he [Denham] would not be accounted the worst poet in England.' Afterwards, despite his military unsuccess, Wither was promoted major, and later was given certain minor civil offices, but for his services to the Commonwealth he would seem to have received nothing substantial by way of reward, and of this he made frequent complaint. At the Restoration, for having written *Vox Vulgi*, a satire on the parliament of 1661, he was flung first into Newgate and then into the Tower; but in 1663 was released. During the plague of 1665 he remained in London, and from it (as from that of 1625) he drew in a work of 1665 many pious lessons. On 2d May 1667 he died, and was buried in the church of the Savoy Hospital in the Strand. In character Wither was sincere, resolute, no flatterer even of Cromwell, temperate, devout. His books number close on a hundred, but almost all his really excellent verse belongs to the first ten years, collected in his *Juvenilia* (1622; enlarged 1626 and 1633; Spenser Soc. 1870–72). His numerous topical pamphlets as a whole are not of account. After his death his poetry fell into almost complete oblivion. By Pope in his *Dunciad*

he is styled 'wretched Withers.' But later the praises of Southey, Sir Egerton Brydges, Hallam, and especially Charles Lamb in his essay, 'Poetical Works of George Wither' (1818), restored his fame. As a religious poet Wither, in the words of Lamb, reached a starry height far above Quarles, and his sweet fancy and exquisite tenderness irresistibly provoke his readers' love. Not seldom he rises into the serene atmosphere of real poetry; but his flight is never steady or long sustained, and bathos is doubly damnable in heptasyllabic couplets. The bright little piece, 'Shall I, wasting in despair' (from *Fidelia*), is known to all English readers, but it is by no means his best poem. Himself, Wither wished to be judged by his later religious and political work, and his earlier poems gave him in later years pangs of unnecessary repentance.

Most of Wither's works were edited or reprinted for the Spenser Society in 1871–83. *Philarete* and *Fidelia* appeared in Edward Arber's 'English Garner'; Henry Morley published a selection in 1891; and two volumes of *The Poems of George Wither* were edited by F. Sidgwick in 1902. Swinburne in his *Miscellanies* (1886) treats amusingly of the copy in his possession of Wither annotated and counter-annotated (ruthlessly after the pedantic Dr G. F. Nott) by Lamb, out of which Lamb's essay grew.

Witherspoon, JOHN, theologian, was born in the parish of Yester in East Lothian, 5th February 1722, studied at Edinburgh, was minister at Beith, at Paisley, and in 1768 was called to be president of the College of New Jersey, and pastor at Princeton. He was a representative of New Jersey to the Continental Congress, became quite blind in 1790, and died at Princeton, 15th November 1794. His works (3 vols. Phila. 1803; and 9 vols. Edin. 1815) include *Ecclesiastical Characteristics* (1753), against the Moderates; *Serious Enquiry into the Nature and Effects of the Stage* (1757); *Justification* (1756); and *Regeneration* (1764).

Witness. See EVIDENCE, OATH.

Witney, a town of Oxfordshire, on the Windrush, 11 miles W. by N. of Oxford (14 by a branch-line, 1861). It has a two-arch bridge (1925), a fine cruciform 13th-century church (restored by Street in 1867), a staple or blanket hall (1721), a market-cross (1683), a town-hall (1863), a corn exchange (1862), and a county court-house (1859). Its blankets enjoy a great reputation; and glove-making is also carried on. Pop. (1921) 3488. See J. A. Giles's *History of Witney* (1852).

Witsius, HERMANN, Dutch theologian, was born at Enkhuysen, 12th February 1636, studied at Groningen, Leyden, and Utrecht, and served as pastor till 1675, when he was called to a chair at Franeker, in 1680 at Utrecht. In 1698 he was called to Leyden, and here he died, 22d October 1708. His great work is *De œconomia Fœderum Dei cum hominibus* (1685; Eng. trans. 3 vols. 1763)—an unsuccessful attempt to establish a middle way between the orthodox and the federalists (see COCCEIUS, COVENANT).

Other writings translated are *Conciliatory Animadversions on the Controversies agitated in Britain under the Names of Antinomians and Neonomians* (Glasgow, 1807), *Dissertations on the Creed* (Edin. 1823), and on the *Lord's Prayer* (1839).

Witt, DE. See DE WITT.

Witten, an industrial town of Westphalia, situated on the Ruhr; pop. 45,500.

Wittenberg, a town of Prussian Saxony, till 1873 a fortress of the third rank, on the Elbe (here 800 feet wide), 59 miles SW. of Berlin. The town is regarded as the cradle of the Reformation. The famous university (1502), where Luther was professor and Hamlet is made by Shakespeare to study, is now removed, and since 1815 incorporated with that of Halle. In the *Stadt-Kirche* are two remarkable pictures by Cranach, in which Melanchthon is represented as administering the sacrament of baptism, and Luther as preaching to a congregation of which the two foremost figures are his wife and son. In the *Schloss-Kirche* (1499, restored 1892—the occasion of a great Luther celebration) are the tombs of Luther and Melanchthon, as well as those of Frederick the Wise (with a noble bronze statue by Vischer) and John the Steadfast, electors of Saxony. Luther nailed his theses to its wooden door, which, burned by the Austrian besiegers in 1760 during the Seven Years' War, was in 1858 replaced by one of bronze bearing the Latin text of those theses. The site of the old Augustinian monastery is now occupied by the Augusteum (1564–83), converted in 1817 into a theological seminary; in its court is Luther's house (part of the old monastery) containing the chair, the table, and portraits by Cranach of the reformer. Melanchthon's house is also shown; there are statues of Luther (by Schadow) and Melanchthon (by Drake); and outside the Elster Gate an oak marks the spot where Luther burned the papal bull. The place is mentioned as early as 1180. The fortifications were repaired by Napoleon in 1813, but it was besieged and stormed by the Prussians (1814). There are iron, distilling, and brewing industries. Pop. (1925) 23,426.

Wittenberge, a Prussian town, where the Elbe is spanned by a bridge a mile long, 54 miles NNW. of Brandenburg, with large cloth and oil factories, and a good shipping trade. Pop. (1925) 25,606.

Witwatersrand. See JOHANNESBURG. The South African School of Mines and Technology became in 1922 the Witwatersrand University.

Włocławek, a town of Poland, on the left bank of the Vistula, 30 miles NW. of Płock, carries on a trade in grain; pop. 40,000.

Woad (*Isătis*), a genus of Cruciferæ, containing only a few species, mostly natives of the Mediterranean region. Dyer's Woad (*I. tinctoria*) was formerly much cultivated both in England and Scotland for the sake of a blue dye obtained from its root-leaves. The use of this dye was practically superseded by indigo. Dyer's woad is a biennial plant, with oblong crenate root-leaves about a foot in length, on pretty long stalks; an upright, much branched leafy stem, about 3 feet high; small yellow flowers, and large seed-vessels, about half an inch long and 2 inches wide, hanging from slender stalks. The leaves when cut are reduced to a paste, which is kept in heaps for about fifteen days to ferment, and then formed into balls which are dried in the sun, and which have a rather agreeable smell, and are of a violet colour within. These balls are subjected to a further fermentation before being used by the dyer. When woad is now used, it is always in union with Indigo (q.v.; and see DYEING, p. 138). It is supposed that *vitrum*, the dye with which Cæsar said almost all the Britons stained their bodies, was woad. See

Dyer's Woad (*Isatis tinctoria*).

Arthur Young's *Agricultural Survey of Lincolnshire* (1799).

Woburn, a small market-town, 13 miles SW. of Bedford. A Cistercian abbey, a daughter house of Fountains, was founded here in 1145, and was granted in 1547 to Earl Russell, afterwards Duke of Bedford. On its site, and incorporating only small parts of the earlier structure, now stands the mansion (mainly 18th century) of Woburn Abbey, which has a noble portrait-gallery, and is surrounded by a park 12 miles in circumference. At Woburn, too, is a great agricultural station, now maintained chiefly by the Royal Agricultural Society.

Woburn, a city of Massachusetts, 10 miles by rail NNW. of Boston, with important manufactures of leather. Pop. (1920) 16,574.

Woden. See ODIN.

Wodrow, ROBERT, church historian, was born at Glasgow in 1679. He entered the university there in 1691, and, after passing through the arts classes, studied theology under his father, who was professor of divinity, and had suffered for conscience' sake during the persecution. In 1697–1701 he was university librarian. In 1703 he was licensed to preach, and appointed minister of the Renfrewshire parish of Eastwood. He married in 1708, and had sixteen children; refused calls to Glasgow and Stirling; and died 21st March 1734. Wodrow's writings, which fill close on fifty volumes of MS., are faithful and laborious, if heavy and one-sided, compilations. One only of them was published in his lifetime—the *History of the Sufferings of the Church of Scotland from the Restoration to the Revolution* (2 vols. fol. 1721–22), which was dedicated to George I., 'the best and greatest of kings,' and earned him in 1725 a grant of 100 guineas. The others include *Lives of the Reformers and most eminent Ministers of the Church of Scotland* (selections, 2 vols. Maitland Club, 1834–45), *Analecta; or a History of Remarkable Providences* (4 vols. Maitland Club, 1842–43), a selection from his *Correspondence* (3 vols. Wodrow Society, 1842–43), and *Biographical Collections relating to the North-east of Scotland* (New Spalding Club, 1890). The Wodrow Society, to perpetuate the memory of Wodrow, was founded in 1841 in Edinburgh for the publication of works of the early writers of the Church of Scotland, and several such works were produced; in 1847 it was dissolved.

See the Memoir by Dr R. Burns prefixed to his edition of the History (4 vols. 1829–30), and others by the younger M'Crie and R. Lippe to the two last-named works.

Woffington, MARGARET, actress, was born, daughter of a Dublin bricklayer, probably about 1714, though it is commonly said some four years later. She grew up a girl of remarkable grace and beauty, and, still a child, became a pupil of Madame Violante, mistress of a rope-dancing booth. From an early age she played on the Dublin stage all manner of parts, from Ophelia to Sir Harry Wildair, and on 6th November 1740 made her first appearance at Covent Garden as Sylvia in the *Recruiting Officer*. Her beauty and grace, her pretty singing and vivacious coquetry, and the exquisite art especially of her male characters carried all hearts by storm. Her one drawback was the harshness of her voice, yet this in no degree hindered the completeness of her triumph. Her character was far from irreproachable, and it is most probable that Garrick never thought seriously of marrying her. But she atoned for all her faults by an irresistible goodness of disposition, and by a charity that knew no bounds. Her sister Mary failed as an actress, but married Captain Cholmondeley, nephew to Horace Walpole, and survived till 1811. Peg Woffington was always singularly independent and sometimes whimsical in her moods, but she kept the affection of the public till the tragic close of her career. On 3d May 1757 she broke down in playing Rosalind, and left the stage for ever. She died 28th March 1760, her last days given to charity, good works, and penitence. She left a noble monument to her memory in her almshouses at Teddington.

See the Lives by Augustin Daly (Philadelphia, 1888) and J. Fitzgerald Molloy (1884); also R. W. Lowe's edition of Dr Doran's *Annals of the English Stage* (3 vols. 1888), and Austin Dobson's introduction (1899) to Charles Reade's *Peg Woffington*, a clever novel enough, but hardly successful as a living realisation of a singularly bright and interesting personality.

Wöhler, FRIEDRICH. See CHEMISTRY, p. 146; LIEBIG.

Woiwode, or VOIVODE (Polish *wojewoda*, Serbian *vojvoda*, Russian *voevoda*), a Slavic word for the leader of an army; later used for an administrative ruler of a province (as now in Poland), or, as formerly in Moldavia and Wallachia, the reigning prince. See also VOJVODINA.

Woking, an urban district of Surrey, 24 miles SW. of London by rail, with an old church (Early English and Decorated; restored 1878), and a beautiful mosque. Nearly 3 miles west, at Brookwood, is the 'London Necropolis Cemetery' (1864). Near was built the first public crematory in England (1878). Four miles NW. of Woking is Bisley (q.v.). Pop. (1921) 26,430.

Wokingham, or OAKINGHAM, a market-town of Berkshire (till 1832 partly in Wiltshire, detached), in Windsor Forest, 7 miles SE. of Reading by rail. Incorporated as a municipal borough in 1885, it has a Gothic town-hall (1860), neighbouring paper, saw, and flour mills, and the 'Rose' inn, where, once detained by wet weather, Gay, Swift, Pope, and Arbuthnot celebrated the host's pretty daughter in the ballad of 'Molly Mog.' It was famous for its bull-baitings till 1821. Pop. (1921) 4473.

Wolcot, JOHN, better known under the pseudonym of 'Peter Pindar,' was born at Doddbrooke, near Kingsbridge, Devonshire, in May 1738. He was educated at Kingsbridge, at Bodmin, and in Normandy at the charge of an uncle, a surgeon of the little Cornish seaport of Fowey; and then, having studied medicine for seven years under him, walked the London hospitals, and taken his M.D. at Aberdeen (1767), he went to Jamaica as medical attendant to the governor, Sir William Trelawny, being made physician-general of the island in 1770. Earlier, in the hope (unfulfilled) of getting a rich living in Jamaica, he had returned to England and obtained ordination (1769) from the Bishop of London. Three years later Trelawny died, whereupon Wolcot forsook Jamaica for England, and started a practice at Truro. Here he discovered the talents of young Opie (q.v.), and with him in 1780 he removed to London, thenceforth to devote himself to writing audacious squibs and satires in verse on all sorts of persons, from George III. down to the city liverymen and even lower. His sixty or seventy poetical pamphlets (1778–1818) include *The Lousiad*, *The Apple-dumplings and a King*, *Whitbread's Brewery visited by their Majesties*, *Bozzy and Piozzi*, and *Lyric Odes* to the Royal Academicians (Wolcot himself was no mean draughtsman). Witty and fluent, but coarse and ephemeral, they have long since outlived their vogue, which was great, for in 1795 he obtained from the booksellers an annuity of £250 for the copyrights. More than this, the ministry

are said by Wolcot himself to have endeavoured vainly to bribe him into silence. Blind for some years, he died at Somers Town, London, 14th January 1819. See *Blackwood's Magazine* for July 1868.

Wolf, a general name for a number of species of the genus Canis. The Common Wolf (*Canis lupus*), found in the northern parts of both hemispheres is a good type. Among its characteristics may be noted the lank, long-legged body, the long snout, the oblique eyes, the erect ears, the tail carried over the haunches. The fur varies considerably in thickness, length, and colour, according to locality and season. It is naturally longer and thicker in northern countries. The commonest colour is yellowish or fulvous gray, but almost black and almost white specimens are known. A full-grown wolf is rather over 5 feet in length, of which 18 inches goes to the tail; its height is 33 inches; and its weight about 100 lb.

Wolves live by themselves in summer and in packs in winter. They are clever and cautious hunters, not lacking in courage, keen of sense, swift of foot, shifting often from place to place. They kill all sorts of backboned animals from deer to hares, usually running them down; but they are rarely aggressive to man unless the pack is starving. They used to do great damage to man's stock, but their numbers are now relatively reduced, except in the more remote and wilder haunts. Their characteristic howl is very different from the dog's bark.

After solitary hunting in summer, wolves congregate in autumn, and the pairing occurs about midwinter. Although they pack, they seem to mate for life. The gestation lasts about two months, and the litter in the den is often large (from six to twelve), the survival of the wolf against civilisation being due to its fecundity as well as to its resourcefulness. The young wolves are blind for twenty-one days, and are suckled for about two months. Before that, however, they have begun to learn to eat flesh which the male brings in and the female prepares. Both parents are solicitous and devoted, and the stories of children being brought up by wolves are not surprising, even if they all lack confirmation. There is a prolonged family life through the first summer, and there can be little doubt that family parties remain together in the pack of the following winter. The great advantage of the pack is in overcoming large animals, such as the European elk and the American bison, or dealing with beasts of prey, such as the Arctic fox. Young wolves are readily tamed, and are pleasant pets for a time.

The wolf was once very common in Britain, as many place-names like Wolverton remind us; the last English wolf is believed to have been killed in the reign of Henry VII., the last in Scotland in 1743, the last in Ireland about 1770. The extermination was partly due to vigorous hunting, prompted by the sport, the damage the wolves did, the price put on their head, and the value of the skin; but another factor was the spread of agriculture, the dwindling of forests, and the diminishing number of wild places.

As to the other wolf species, excluding jackals and the wild dogs of south-eastern Asia, there is considerable difference of opinion. Thus in North America some would make separate species of the Arctic Wolf (*Canis tundrarum*), white all the year round, preying upon the musk-ox and the caribou and much smaller mammals; as also of the Gray or Timber Wolf (*Canis nubilus*) that used to persecute the bison, and is still abundant in some parts, e.g. in the Rocky Mountain region; but other authorities would regard both of these as varieties of the Common Wolf. A better case for distinctness can be made out for the Prairie Wolf or Plains Coyote (*Canis latrans*), a small wolf, less social than the Gray Wolf, destructive to poultry and young live stock, but useful in checking the multiplication of rodents. Not far removed is the very omnivorous Arizona Coyote (*Canis mearnsi*). Claims for distinctiveness are also made for the Japanese Wolf (*Canis hodophylax*) and for the Common Indian Wolf (*Canis pallipes*). But all of them are, to say the least, not far removed from the Common Wolf, which is admittedly a variable species. It may be noted that the evidence is strong in favour of the conclusion that the dingo of Australia is the domestic dog (*Canis familiaris*) gone wild; and it is of some interest that Studer's Stone-Age dog (*Canis putiatini*), the probable ancestor of European domestic dogs, had some dingo-like features. As to the origin of Studer's Stone-Age dog, it is probably to be found in a wolf of the Mediterranean region.

Wolves have entered in various ways into man's superstitions, as in the wild-spread idea of men and women assuming their guise (see WERWOLF); and from Aristotle onwards they have formed a basis for fiction. The worst of these is expressed in the proverb, *lupus lupo lupus*, 'a wolf is a wolf to other wolves.' The fact is that the wolf is loyal to the pack.

See Mivart's *Dogs, Jackals, Wolves, and Foxes: a Monograph of the Canidæ* (1890).

Wolf, FERDINAND, a great Romance scholar, was born at Vienna, December 8, 1796, studied philosophy and jurisprudence at Gratz, then accepted a post in the royal library at Vienna. He took an active part in the foundation of the Academy of Sciences, and died February 18, 1866. Among his books were *Floresta de rimas modernas Castellanas* (2 vols. 1837), *Ueber die Lais, Sequenzen und Leiche* (1841), *Studien zur Geschichte der Spanischen und Portugiesischen Nationallitteratur* (1859), and *Histoire de la Littérature Brésilienne* (1863). Together with C. Hofmann he edited a collection of the oldest Spanish romances, *Primavera y flor de Romances* (2 vols. 1856). Besides he made numerous contributions of the greatest value on questions of Romance scholarship to the Vienna *Jahrbücher der Litteratur*, most of which were also dispersed as off-prints. He also contributed notes to the German translation of Ticknor's *History of Spanish Literature*, and left a supplement to it which was edited by his son (1867), who also printed a selection from his father's learned correspondence.

Wolf, FRIEDRICH AUGUST, the most gifted classical scholar and first critic of his age, was born at Hainrode near Nordhausen, 15th February 1759, son of the village schoolmaster and organist. His father removing to Nordhausen, he was sent to the gymnasium there, but his real education he gave himself with a zeal almost unparalleled in the annals of human learning. While still a schoolboy, besides a wide range in classical reading, he had mastered French, Italian, Spanish, Hebrew, and English, and perfected himself in the theory and practice of music. In April 1777 he went to the university of Göttingen, and inscribed himself in the matriculation-book as 'student of philology,' the first instance at any university. 'The matriculation was an epoch in German education,' says Mark Pattison. He attended the lectures very irregularly, being already much given to private study. For the rest he led a very retired life, was little visited or known, and was intimate only with a few. From Heyne, who once excluded him from his lectures on Pindar for his former irregularity, he kept himself quite aloof. That overpraised scholar coldly returned him the dissertation he laid before him in 1779, containing some

novel views regarding the Homeric poems. The same year Wolf went as teacher to the Pædagogium at Ilfeld, and there first established his fame by an edition of the *Symposium* of Plato, with notes and introduction in German. In 1782 he was appointed to the rectorship of the High School at Osterode, in the Harz; and in 1783 he accepted an invitation to Halle as professor of Philology and Pädagogik. Here he spent twenty-three delightful years, giving a new meaning to philology, which he defined as 'knowledge of human nature as exhibited in antiquity.' As a science of interpretation it embraces literature, art, and, indeed, anything distinctly characteristic in the life of antiquity. At first he rather estranged than attracted students by the high tone of his teaching. However he learned to adapt himself to his audience, and was soon surrounded by a crowd of eager pupils. In his famous *Seminarium* he lavished all the stores of his mind upon his pupils, giving them also a brotherly sympathy and comradeship that aroused their enthusiasm. Three of his pupils were especially dear to him, Heindorf, Immanuel Bekker, and August Böckh. Before all things a teacher, literary labours and fame he looked upon more as a subordinate object, and all his writings were written merely on the spur of occasion and necessity. Yet he established his reputation as a scholar and critic by an edition of Demosthenes' *Oratio adversus Leptinem* (1789), and still more by his celebrated *Prolegomena ad Homerum* (1795), in which he unfolded, with equal erudition and acuteness, his bold theory that the *Odyssey* and *Iliad* are composed of numerous ballads by different minstrels, strung together in a kind of unity by subsequent editors. He maintains (1) that the Homeric poems were composed without the aid of writing, which was impossible for literary purposes about 950 B.C.; that they were handed down by oral recitation, suffering many changes in the process; (2) that the poems suffered many more changes after they were written down (*c.* 550 B.C.), made by revisers (διασκευασταί) or by learned critics with critical theories of their own; (3) that there is an artistic unity in the *Iliad*, still more in the *Odyssey*, but this is not due to the original poems, but the effect of the later redactions; (4) that the original poems, from which they have been put together, were not all by the same author. Yet he does not deny a personal Homer, but believes him a sovereign genius who 'began the weaving of the web.' This work made a great sensation through the whole of Europe. Heyne insinuated that the Prolegomena were only a reproduction of what Wolf had heard at Göttingen. This gave rise to the spirited *Briefe an Heyne* (1797). In 1802 Wolf confirmed the suspicions, first broached by Markland in England, of the genuineness of five orations attributed to Cicero. After the disasters of 1806 the university at Halle was dispersed, and Wolf became member of the Academy of Sciences at Berlin, where he took an active part in the reorganisation of the university, and was appointed a professor. He also received a post in the department for public instruction; but failed in tact and quarrelled with everybody. He died at Marseilles, 8th August 1824.

While in Berlin he edited along with Buttmann the *Museum der Alterthumswissenschaften* (1807–10), and afterwards the *Litterarische Analecten* (1817–20). From his papers were published *Ideen über Erziehung, Schule und Universität* (1835). The *Darstellung der Alterthumswissenschaft* (1807) is his most finished work. See books by Hanhart (1825); Körte (2 vols. 1833); Arnoldt (2 vols. 1861–62); Mark Pattison's admirable account of him in his *Essays* (1889); and Sandys, *History of Classical Scholarship* (vol. iii. 1908) in English.

Wolf, Hugo (1860–1903), composer, was born in humble circumstances at Windischgraz in Styria, was largely self-taught in music, and lived for the most part in poverty in Vienna, where he died, after having been insane for the last five years of his life. He composed the lyrical opera *Der Corregidor* (1896), on the novel of the modern Spanish author Alarcón, but his fame rests on over 275 songs for 'voice and piano,' the majority written 1888–91, being settings chiefly of poems of Mörike, Goethe, Eichendorff, Heyse, and Keller. With unerring psychology, Wolf could identify himself with the particular mood of the poet and could 'visualise' the individual character of the poem, adapting his style accordingly. The range of expression in Wolf's songs is as remarkable as the depth of perception, while the piano parts are extremely striking and independent, combining with the voice in free counterpoint.

The standard Life is by Decsey (4 vols. in Ger. 1903–4; rev. ed. 1 vol. 1919); see also studies by E. Newman (in Eng. 1907) and Morold (in Ger. 2d. ed. 1920). A selection of Wolf's *Critical Essays* (written when he was critic for the *Salonblatt*, 1884–87) was published by Batka and Werner (1911).

Wolf, or Wolff, Johann Christian von, philosopher and mathematician, was born a poor tanner's son at Breslau, 24th January 1679. At Jena he studied theology, but much more mathematics and philosophy, especially the writings of Descartes and Tschirnhausen. His annotations to the *Medicina mentis* of the latter brought him into connection with Leibniz. In 1703 he began to give lectures at Leipzig in mathematics and philosophy, and when the incursion of Charles XII. into Saxony drove him from Leipzig he was called to Halle, on the recommendation of Leibnitz, to the chair of Mathematics and Natural Philosophy. His system of metaphysical and moral philosophy, worked out according to strict mathematical method, quickly spread through Germany, but Wolf was violently attacked by his pietistic colleagues in Halle, declared to be a despiser of religion, and a teacher of error, and formally accused to the government. The immediate ground of the accusation was an oration 'On the moral philosophy of the Chinese,' in which he spoke with approval of the morality of Confucius; but moreover the basest insinuations were brought against him as an advocate of anarchy. The Prussian king, Frederick-William I., was prejudiced against him by an argument that appealed to him. 'What does this pre-established harmony mean?' asked the king in his tobacco-parliament. 'It means,' was the reply, 'that if your tallest grenadier runs away, he can, properly speaking, not be justly punished, because his running away is, indeed, merely a piece of the pre-established harmony.' By a cabinet decree of November 15, 1723, Wolf was ordered on pain of death to quit Halle in twenty-four hours, and the Prussian dominions in two days; he was warmly received in Cassel, and appointed to a chair in Marburg. The dispute about his philosophical system now became general, and all Germany took part either for or against him, the victory ever inclining more and more to Wolf. Frederick the Great recalled him on his accession (1740) to be professor of the Law of Nature and Nations, and in 1743 he became chancellor of the university, and was raised to the rank of Baron of the Empire by the Elector of Bavaria during the regency. He died at Halle, April 5, 1754. Before his death he saw his philosophy spread over the whole of Germany and a great part of Europe; but he had outlived his reputation as an academical teacher. Wolf systematised and popularised the philosophy of Leibniz, but his great fundamental principle of inlying purpose by Wolf was vulgarised and weakened into

external utility. His *Theologia Naturalis* treats at immense length the existence and attributes of God, and gave an impulse to that development of natural theology and rationalism which soon almost drove out revelation by rendering it unnecessary. He did not intend to question the fact of a historical revelation, but he made it impossible by the criteria of revelation which he established, and Reimarus and the thinkers of the *Aufklärung* made the further step. The Wolfian philosophy held the world until the rise of Kant; and an important section of Kant's work was a destructive criticism of Wolf's dogmatism.

Wolf's works on philosophy fill twenty-two quarto volumes. See *Christian Wolfs eigne Lebensbeschreibung*, ed. by Wuttke (1841); the 18th-century books of Ludovici; and works cited at KANT.

Wolfe, CHARLES, was born at Dublin, 14th December 1791. On the death of his father, a Kildare gentleman, the family came to England, and the boy received his chief education at Winchester. In 1809 he entered the university of Dublin, gained a scholarship, and in 1814 took his B.A. In 1817 his *Burial of Sir John Moore* was suggested by Southey's impressive account of it in the *Edinburgh Annual Register*, and soon after found its way anonymously into the newspapers. So admired was the poem that even whilst the name of its author remained unknown, and it was ascribed to Campbell, Byron, &c., it had won for itself a secure place in the heart of the nation. Wolfe in 1817 became curate of Ballyclog, in Tyrone, and then rector of Donoughmore. Symptoms of consumption appearing, he tried in search of health, successively, England, the south of France, and finally the sheltered Cove of Cork, and here he died, 21st February 1823. His *Remains*, mainly sermons and poems, were published, with memoir, in 1825 by Archdeacon Russell; and an edition of the poems by C. Litton Falkiner in 1903.

Wolfe, JAMES, the conqueror of Quebec, was born at Westerham vicarage, Kent, on 2d January 1727. He came of mixed Welsh-Irish-Yorkshire ancestry, the eldest son of General Edward Wolfe (1685–1759), an officer of merit and distinction, who served under Marlborough, and the beautiful Henrietta Thompson (1704–64). With his younger brother, Edward (1728–44), he was educated at Westerham and Greenwich. From the first he was bent upon following his father's profession of arms; and, balked by illness at thirteen of a share in the unfortunate Cartagena expedition, in 1742 he received an ensign's commission in a foot regiment. In 1743 he took part in the famous battle of Dettingen, boy though he was, as adjutant of his regiment; in 1744 he obtained his captaincy; and in 1745–46 he served against the Scottish rebels, being present at the battles of Falkirk and Culloden. Again abroad on service in 1747, he was wounded, though not seriously, at the battle of Lawfeldt, and so distinguished himself that he was publicly thanked by the Duke of Cumberland. From 1749 to 1757, with occasional interruptions, such as a six months' residence in Paris, he was engaged in garrison duty in Scotland and England; his interesting correspondence with his mother shows that he had no great liking for the former country and its inhabitants. In the mismanaged expedition against Rochefort (1757) Wolfe acted as quartermaster-general. The total failure of the operations brought disgrace to nearly all concerned; but it became known that had Wolfe's counsels been followed the result would almost certainly have been different. Pitt's attention was now first decisively drawn to him as an officer of whom great things might be expected; and in 1758, with the full rank of colonel, he was appointed to the command of a brigade in the expedition against Cape Breton under General Amherst. A brilliant success was obtained in the capture of the strong fortress of Louisburg (q.v.) after a seven weeks' siege; that it was mainly due to Wolfe's skill, boldness, and activity was clearly understood, and he became popularly known as the 'Hero of Louisburg.' Pitt was now organising his grand scheme for expelling the French from Canada; he 'sought for merit wherever it was to be found;' and the expedition which had for its object the capture of Quebec, the enemy's capital, he confided to Wolfe's command, allowing him, as far as possible, a *carte blanche* in the choice of his subordinate officers. Advanced to the rank of major-general, and commanding 9000 men, Wolfe sailed from England on 17th February 1759, and on 26th June landed his forces on the Isle of Orleans, opposite Quebec. The attack, to which he had looked forward as 'a very *nice* operation,' proved one of stupendous, indeed nearly hopeless difficulty. The system of defence adopted by his adversary, the skilful and wary Montcalm (q.v.), was such as to offer no point of advantage. In all his attempts, though seconded most ably by Admiral Saunders, who commanded the fleet, Wolfe found himself completely foiled. The season wore fast away during which operations could be continued; but at last, having dropped down the river, and scaled the cliffs at a point insufficiently guarded—a feat of such frightful risk as in war has scarcely a parallel—at the day-dawn of 13th September Wolfe found himself on the Plains of Abraham, where, his supplies thus cut off, Montcalm had no choice but to give battle. The forces were probably equal, between four and five thousand men; but Wolfe had no doubt of victory, and the result justified his confidence. After a short struggle the French were driven from the field in complete rout; Montcalm was one of 500 killed; the capitulation of Quebec followed five days after; and its fall decided the fate of Canada. Wolfe died in the hour of victory. In person he led the right, until, thrice wounded, he was carried to the rear. He lived to hear the cry, 'They run! see how they run!' and expired with the words, 'Now God be praised, I will die in peace.' His body was brought home and buried in Greenwich church, and a monument was erected to him in Westminster Abbey. He was only thirty-two, yet he stands among the foremost English generals.

See *Lives* by Wright (1864), Bradley (1895), Salmon (1909); *Life and Letters* by Willson (1909); *Montcalm and Wolfe* by Parkman (1885); *Wolfe and Montcalm* by H. R. Casgrain (1906); *The Siege of Quebec*, ed. Doughty (6 vols. Quebec, 1903); Wood, *Winning of Canada* (1915).

Wolfenbüttel, an old town of Brunswick, on the Oker, 7 miles S. of Brunswick by rail. One of the old churches contains many of the tombs of the princes of Brunswick. The old castle now accommodates a seminary for teachers and a theatre. The library opposite, built in 1723 in the form of the Pantheon at Rome, became famous for its literary wealth and for the fact that Lessing was its librarian. It was Lessing who edited the 'Wolfenbüttel Fragments' professedly from anonymous MSS. under his charge, but really from the pen of his friend Reimarus (q.v.), which startled the theological world of Germany. The Pantheon building had become so rickety and dangerous that it had to be taken down, being superseded in 1887 by a handsome new edifice, which houses a large collection, rich in Bibles, incunabula, and MSS.—one of them the 14th-century manuscript of Fordun's *Scotichronicon* stolen by M. Flacius Illyricus. There are in the town

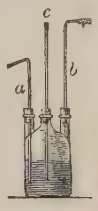
manufactures of machines, copper goods, flax, cloth, corks, leather, preserves, tobacco, &c.; pop. (1925) 19,435. The place is very ancient, and dates from 1046; it was besieged and taken in 1193 and 1542; and during the Thirty Years' War a battle was fought here in 1641.

Wolff, Joseph, D.D. (1795–1862), a German Jew who turned Roman Catholic in 1812, Anglican in 1819, becoming a missionary to the Jews in the East. He made many journeys, his most notable and adventurous to Bokhara (1843). He published accounts of his journeys and missionary labours, married a daughter of the Earl of Orford, and died vicar of Isle-Brewers, Somerset.

Wolff, Kaspar Friedrich (1733–94), author of the *Theoria Generationis* (1759) and founder of Embryology (q.v.), was born in Berlin, was a surgeon in the Seven Years' War, and died a member of the Academy at St Petersburg.

Wolf-Ferrari, Ermanno, Italian composer, was born at Venice in 1876, studied under Rheinberger at Munich, and directed the Liceo Marcello at Venice 1902–9. His best-known works include the cantata *La Vita Nuova* (1903), and the operas *Il Segreto di Susanna* (1909) and *I Giojelli della Madonna* (1911), and are characterised by strong melodic invention and by vigorous writing that at times becomes rather boisterous.

Wolffian Bodies (named after the embryologist K. F. Wolff, 1733–94) form part of the renal system in the embryo of vertebrates. They consist of a number of excretory tubules, technically known as the mesonephros. They may form the permanent kidney (as in gristly fishes and amphibians), or may more or less entirely disappear as such (as in reptiles, birds, and mammals), but they may also become secondarily connected with the testes, forming the epididymis. Their duct—the Wolffian duct—becomes the seminal duct in male Elasmobranchs and in higher vertebrates, and the urinogenital duct in male amphibians.



Wolffian Bottles.

Wolffian Bottles, or Woulfe's Bottles, bottles like that in the figure, named from the London chemist Peter Woulfe (1727–1806). They are used for the purpose of purifying gases, or of dissolving them in suitable solvents. The gas is passed in at the tube, *a*, which dips below the surface of the liquid, and as it bubbles through is either dissolved or passes on to a second bottle by means of the tube, *b*. The neck through which *c* passes may be fitted either with a cork or with a tube as shown, admitting air so as to prevent undue rarefaction.

Wolf-fish, or Cat-fish (*Anarrhichas lupus*), a fish related to the blennies, common in north temperate seas, and not unfrequent on northern British coasts. It is famous for its ferocious appearance and habit. The stout body is usually about 3 feet in length, but may be a foot or two more; the massive head has a blunt profile, and the open mouth, with its formidable teeth, is suggestive of a carnivorous mammal; the skin is slimy, and bears only rudimentary scales; the general colour is brownish gray, crossed by about a dozen dark bands, and spotted; the dorsal and anal fins are long, the pelvic fins are absent. The teeth are very remarkable, those in front like canines, those on the sides of the lower jaw tubercled, those on the palate pavement-like. They are adapted for seizing and crushing molluscs, crustaceans, and sea-urchins. The wolf-fish is fond of rocky bottoms, but it is often caught where it is not much wanted, on cod-lines. It bites savagely when caught, and is often destructive to nets. Its ferocious appearance and habits, and its peculiar smell, are responsible for a prejudice which prevents it from being justly esteemed as a food-fish, for as such it is certainly valuable and, according

Wolf-fish (*Anarrhichas lupus*).

to some, 'delicious.' The thick skin is sometimes made into bags. On the Pacific coast of North America there is an even larger form (*A. ocellatus*), also of use as a food-fish.

Wolf-hound, or Borzoi, a breed of dog first imported in numbers into England from Russia about the year 1885. In shape the borzoi is like a gigantic greyhound, though covered with a soft coat about the length of a deerhound's. In Britain the breed became very popular owing to its peculiar grace and beauty. Though supposed to be

Wolf-hound, or Borzoi.
(From a Photograph by Gambier Bolton, F.Z.S.)

able to attack and kill a wolf, the Russian wolfhound is exceedingly gentle. In trials with wolves in America the Borzoi failed signally.—The Irish wolf-hound was identical in shape and appearance with the Scottish deerhound. Attempts have been made to revive the breed, but it is admitted that pure specimens are no longer obtainable.

Wolfram. See Tungsten.

Wolfram von Eschenbach, a mediæval German poet, born in the end of the 12th century, near Anspach in Bavaria. He lived some time at Eisenach at the court of Hermann, Count of Thuringia, where he met Walther von der Vogelweide. His death took place after 1215. Besides *Parzival* he left seven *Love Songs*, a short epic, *Willehalm*, and two fragments called *Titurel*. Wolfram's works, written in Middle High German, were held in great esteem down to the Reformation. The *Parzival* is an epic, having for its main theme

the history of the Grail (q.v.). Composed between 1204 and the author's death, it is, if we except the popular national epics, such as the *Nibelungenlied*, the greatest poetical production of German literature during the middle ages. To this supreme position it is entitled in virtue of its high imaginative qualities, its poetic truth and beauty, and its pure and lofty ethical strain. Besides it is a valuable picture and symbol of the age in which the writer lived, a translation into language of the ideals and aspirations of chivalry in its noblest phases of existence. It has been translated into Modern High German by San Marte (1886) and by Simrock (1883), the latter version being the more faithful and accurate, but the more difficult to read. It was from this poem that Wagner derived the libretto for his magnificent opera *Parsifal*.

Wolf Rock, 8 miles SSW. of Land's End, has a lighthouse (1862–69) 116½ feet high.

Wolf's-bane. See ACONITE.

Wolf-spider. See TARANTULA.

Wolgast, a small Pomeranian seaport, stands on the Peene, about 10 miles from its entrance into the Baltic, and 36 miles SE. of Stralsund by rail. It was once strongly fortified; it was taken and retaken five times between 1628 and 1675; the Russians plundered and burned it in 1713, and the Swedes retook it in 1715.

Wollaston, WILLIAM, author of the *Religion of Nature*, was born at Coton near Stafford, 26th March 1659, and educated at Shenstone and Lichfield, till in 1674 he went up to Sidney Sussex College, Cambridge. In 1681, having taken his M.A., he was ordained, and next year became an assistant-master at Birmingham; but in 1688 he inherited from a cousin a very ample estate. Thereupon he married a wife, who bore him eleven children, and retired to a house in Charterhouse Square, London, from which he was never absent one whole night in upwards of thirty years till his death on 29th October 1724. Not long before he had burned several treatises, as 'short of that perfection to which he desired and intended to bring them;' and the one forgotten work by which he is remembered was first printed in 1722 for private circulation, though it soon reached an issue of over 10,000 copies. It is a development of Samuel Clarke's system, its methods exclusively rational, its conclusions optimistic; all sin, by its showing, is a denial of what is, and heaven is a necessary counterpoise for earthly misery.

See the Life prefixed to the 6th edition of the *Religion of Nature* (1738), and chaps. iii. and ix. of Leslie Stephen's *History of English Thought in the Eighteenth Century* (2d ed. 1881).

Wollaston, WILLIAM HYDE, 'one of the ablest and most renowned of English chemists and natural philosophers,' was born at East Dereham, Norfolk, 6th August 1766. He was the second son of the seventeen children of the Rev. Francis Wollaston (1731–1815), who was the grandson of the preceding, rector of Chiselhurst, and an ardent astronomer. He went up to Caius College, Cambridge; took his M.B. in 1787, his M.D. in 1793; and gained a fellowship. Starting practice as a physician in Bury St Edmunds in 1789, he soon removed to London; but being beaten in a competition for the post of physician to St George's Hospital in 1800, he vowed 'never more to write a prescription, were it for his own father,' but to devote himself wholly to scientific research. This resolve (which by some is ascribed to an accession of fortune) proved ultimately most beneficial, leading him rapidly to fame and wealth; for, unlike many eminent investigators of nature's laws and phenomena, Wollaston combined 'the genius of the philosopher with the skill of the artist,' and succeeded in making industrial applications of several of his important discoveries. His researches were prosecuted over a wide field, but were pre-eminently fruitful in the sciences of chemistry and optics. To the facts of the former science he added the discovery of new compounds connected with the production of gouty and urinary concretions, such as phosphate of lime, ammonio-magnesian phosphate (a mixture of these two forming the 'fusible' calculus), oxalate of lime, and cystic oxide; also the discovery in the ore of platinum of two new metals, palladium (1804) and rhodium (1805). By his ingenious method of rendering platinum ductile (see DUCTILITY) he made £30,000; and some other practical discoveries were also highly lucrative. His contributions to optics were the reflecting Goniometer (q.v.), the Camera Lucida (q.v.), the discovery of the dark lines in the solar Spectrum (q.v.), and of the invisible rays beyond the violet, and an immensity of valuable observations on single and double refraction. He did much to establish the theory of definite proportions, and was the first to demonstrate the identity of galvanism and common electricity, to account for the difference in the phenomena of each, &c. He was elected a fellow of the Royal Society (1793), its second secretary (1806), and a fellow of the Astronomical Society (1828). On 22d December 1828 he died in London of a tumour on the brain. He was a reserved and austere student, of whom yet we get pleasant glimpses in Lockhart's *Scott* and in Miss Edgeworth's *Letters*, on occasion capable of splendid generosity.

See his 39 memoirs in the *Phil. Trans.*, the sketch in G. Wilson's *Religio Chemici* (1862), and the article in *Dict. Nat. Biog.* (1900).

Wollongong, a coastal town of New South Wales, 48 miles S. of Sydney, the centre of a dairying and coal-mining district. Its value as a seaport has been lessened by the construction of a fine artificial harbour at Port Kembla, five miles to the south. Pop. 6700.

Wollstonecraft, MARY. See GODWIN.

Wolseley (VISCOUNT), GENERAL SIR GARNET JOSEPH, was born at Golden Bridge House, County Dublin, 4th June 1833. The Wolseleys are an old Staffordshire family, the manor of Wolseley having been in their possession before the Conquest. Educated by private tutors, and at a day-school near Dublin, he early showed a predilection for a military life, and his name was put down for a commission at fourteen. He entered the army in 1852, and thenceforward was constantly engaged in the service of his country, proving himself a genuine soldier, and delighting in dash and danger. He served in the Burmese war of 1852–53, and was dangerously wounded in the left thigh; he was severely wounded in the Crimea, where he served in the 90th Light Infantry; he lost the use of one eye, and had some marvellous escapes, and received the cross of the Legion of Honour for his bravery there. He was in India during the mutiny, and at its close received the brevet of lieut.-colonel though only twenty-six; and in the Chinese war of 1860. Next year he went to Canada, and in 1870 successfully put down the Red River rebellion under Louis Riel without losing a man. He commanded the successful Ashanti expedition, receiving the thanks of parliament and a grant of £25,000, and held high command in Natal (1875), Cyprus (1878), and Natal and the Transvaal. He was commander-in-chief of the brief and brilliant Egyptian campaign in 1882, received the thanks of parliament and a money grant, and became Baron Wolseley. It was not his fault that the Gordon Relief Expedition, which he commanded (1884–85) failed; he was made

successively general, viscount, commander-in-chief in Ireland, field-marshal (1894), and (1895–1900) commander-in-chief. An energetic organiser and army reformer he inspired Cardwell's short service system (which made an army reserve possible) and the abolition of the purchase system; and it was he who made soldiering a serious and scientific profession. He published a *Narrative of the War with China in 1860* (1862); the *Soldier's Pocket Book;* an essay on *Field Manœuvres* (1872); a novel (*Marley Castle,* 1877); a Life of Marlborough (1894); *The Decline and Fall of Napoleon* (1895); and the autobiographical *Story of a Soldier's Life* (1903). He died 24th March 1913, and was buried in Westminster Abbey. See Life by Maurice and Arthur (1924).

Wolsey, THOMAS, cardinal, was born at Ipswich in 1471. His father, Robert Wolsey, seems to have been a grazier, wool-merchant, butcher, baker, and innkeeper of good substance, as also churchwarden of St Nicholas parish. In his eleventh year Thomas was sent to Magdalen College, Oxford, where at the age (early even for that time) of fifteen he took the diploma of Bachelor of Arts. In view of his subsequent career it is noted as a curious circumstance that his favourite study was the *Summa Theologiæ* of Thomas Aquinas, with which he became so conversant that he was known among his friends as *Thomisticus.* As a fellow of Magdalen, and master of the school attached to that college, he remained at the university till 1500, when the Marquis of Dorset gave him the living of Limington in Somerset. In 1501 he became chaplain to Henry Dean, Archbishop of Canterbury, and in 1506 a royal chaplain, acting at court as secretary to Fox, Bishop of Winchester. In 1508 he was sent on an embassy to Scotland, and in the autumn of the same year to the Low Countries to further a project of marriage between Henry VII. and Margaret, daughter of the Emperor Maximilian. As a reward for his general usefulness, Henry bestowed on him the deanery of Lincoln, the beginning of his immense fortunes.

But it is with the accession of Henry VIII. that the story of Wolsey's greatness begins. Appointed king's almoner and member of the king's council (1511), he speedily made himself an indispensable servant of the young king. In the war with France of 1513 he showed such energy and ability that Henry bestowed on him the bishopric of Tournai (an appointment never confirmed by the pope), and in the following year the sees of Lincoln and York. In 1514 Wolsey still further advanced his interests by contriving an understanding between England and France, which was the beginning of the continental policy he pursued till his fall in 1529. Though unpopular with the English people, this alliance first taught the continental powers that England was a factor to be reckoned with in all their future combinations. Wolsey was now one of the leading personages in Europe, and honours fell thick upon him from every side. He held *in commendam* the sees, successively, of Bath and Wells (1518), Durham (1523), and Winchester (1529); as also the abbey of St Albans. The year 1515 saw him Lord Chancellor of England, and Cardinal; and in 1517 Leo. X., greatly against his will, was forced to appoint him Cardinal-legate. So great was Wolsey's predominance even at this point of his career that a Venetian ambassador said of him, 'He is seven times more powerful than the pope.' Twice, indeed, in his career he was actually within sight of the popedom itself. On the death of Leo X. in 1521 Wolsey's claim to the succession was strongly supported by Henry, and he had the promise of the emperor's good offices in his favour. But, whether Charles was sincere or not in his promise, when the choice came to be made he set aside Wolsey in favour of a candidate more likely to be at his bidding—Adrian of Utrecht, formerly his own tutor, and now acting as his regent in Spain. At Adrian's death, two years later, there was again a prospect of Wolsey's reaching the goal of his ambition; but Charles on this occasion also played him false, and another opportunity never occurred.

In the career of Wolsey, as in the development of modern Europe, a new chapter opens with the accession of Charles of Spain to the Empire in 1519. For the next quarter of a century the political history of Europe is mainly the history of the rivalry of Charles V. and Francis I. of France for the leading place among the western nations. To hold the balance between these two potentates, so that each should in turn be forced to make common cause with England, such was the foreign policy of Wolsey during the ten years he directed the affairs of his country. The skill and force with which he carried out his purposes is all the more striking that in Henry VIII. he had a master whose violent and jealous spirit would have thwarted a less able minister at every step. But with consummate art, while leading Henry to believe that he was the humble instrument of his wishes, Wolsey in reality controlled the destinies of the country. The policy of England during these years has been sketched in the account of Henry VIII. Here, therefore, it is enough to say that this policy was essentially the work of Wolsey, and that its result for England was the recovery of her place among the nations, which had been lost since the Wars of the Roses.

Wolsey's home policy was conducted on the simplest principles. In his conception it was the best interest of the country that the sovereign's will should be the one motive-power in the state, and parliaments existed simply for supplying the means for the execution of the royal commands. In accordance with these principles he made such frequent and large demands on the purse of the country that all ranks of the people detested him as the author of the ills from which they suffered during Henry's rule. Notable among Wolsey's domestic acts is his dissolution in 1524–29 of above thirty monasteries with fewer than seven inmates. This was done with the full consent of Rome; but, as it proved, Wolsey by this step led the way which Henry was afterwards to follow with such disastrous results to the ancient church in England. Wolsey's zeal for learning, as nobly shown in his foundation of a college in his native town of Ipswich, and of Cardinal College at Oxford, has always been noted as one of the redeeming traits of his character; and it is proof of the sincerity of his zeal that, in the wreck of his fortunes, one of his main concerns was that his college at Oxford should not suffer by his own ruin. The college at Ipswich, however, did not take definite shape, and Cardinal College, afterwards named Christ Church in despite to the memory of Wolsey, but inadequately fulfilled the aims of its founder.

It is part of the greatness of Wolsey's fortunes that his fate is linked with an event which is in itself a turning-point in the history of Christendom. In 1527 the annulment of Henry's marriage with Catherine of Aragon became a question that took precedence of all others, and Wolsey had to find a satisfactory solution if he was to retain his position as the first subject in England. He had no choice but to use his best efforts to persuade Clement VII. to pronounce Henry's marriage illegal. In 1529, along with Campeggio, the legate specially sent by the pope, Wolsey sat in judgment on the case, with a result that left Henry as far as ever from the attainment of his end. This was no fault of Wolsey's, who was powerless against the

diplomacy of Rome; but Henry was now in a mood that needed a victim, and the cardinal's enemies, reinforced by Anne Boleyn, had been long waiting their opportunity. Indicted for a breach of *præmunire* in procuring bulls from Rome, he was deprived of the Great Seal, and ordered to depart from his palace of York Place, and to take up his residence at Esher, near Hampton Court. Found guilty by parliament of the charges brought against him, he nevertheless obtained his pardon, and was allowed to retain the see of York. At Cawood, in Yorkshire, during the few months that were left to him, he won the hearts of the people by his charity and kindly demeanour. But his enemies could not be satisfied till his ruin was complete. On a charge of high-treason, to which he had imprudently given colour by his own intrigues, he was arrested by the Earl of Northumberland. This last stroke showed Wolsey that thenceforward he had nothing to hope, and seems to have completely broken his proud spirit. On the way to London to meet his trial he died at Leicester Abbey (November 29, 1530), with the well-known words on his lips, 'Had I but served God as diligently as I have served the king, He would not have given me over in my gray hairs.' 'No statesman of such eminence,' says Dr Brewer of Wolsey, 'ever died less lamented;' and he has remained one of the unpopular characters of English history. Except during his last days there was nothing in his character or career that was fitted to win the heart or touch the imagination of the people. They could not understand what he did for England abroad; and at home they saw the result of his policy only in the grinding taxation for which they naturally held him responsible rather than the youthful and pleasure-loving king. His arrogance and ostentation gave the greater offence in one who had come from the ranks of the people, and the tenor of whose life was so little in accordance with the profession of which he was the chief representative in the country. Disliked by the commons, he was detested by the nobility, whom his greatness overshadowed, and whom he did not think it worth his trouble to conciliate. It is only since the publication of the State Papers of the period that Wolsey has received his due as a statesman of the first rank, whose ambition was coincident with the interest of his country as he conceived it. While his public aims, however, are thus seen to have been nobler than his contemporaries supposed, in his personal character, in his embodiment of a type of churchman most alien to the religion which he represented, Wolsey still remains a figure associated with no principle of beneficence, and essentially repellent in all the salient features of his mind and heart.

See CROMWELL (THOMAS); Lives of Wolsey by George Cavendish (q.v.), Wolsey's gentleman-usher, from which the splendid figure in Shakespeare's *Henry VIII.* is closely drawn, Fiddes (1724), Grove (1742), Galt the novelist (1812), Martin (1862), Bishop Creighton (1888); Lord Acton in *Quarterly Review*, January 1877; books cited at HENRY VIII.; Gasquet, *Henry VIII. and the English Monasteries* (1888–89); and Father Taunton, *Thomas Wolsey, Legate and Reformer* (1902).

Wolter, CHARLOTTE (1834–97), Austrian tragic actress, was born at Cologne, made her début at Budapest in 1857, appeared with great success in Berlin, and acted regularly at the Hofburg Theatre, Vienna (1862–97). In 1874 she married Count O'Sullivan, who predeceased her. She excelled especially in the classical dramas of Racine, Shakespeare, Grillparzer, &c.

Wolverhampton, a municipal, parliamentary, and county borough, the 'metropolis of the Black Country,' stands on a gentle eminence amid a network of railways and canals, 13 miles NW. of Birmingham, 15 S. of Stafford, and 126 NW. of London. It was first called 'Hamton,' and then 'Wulfrunishamton,' after Wulfruna, King Edgar's sister, had founded in 996 St Peter's Church, which continued collegiate till 1846. Rebuilt during the 13th, 14th, and 15th centuries, and enlarged and elaborately restored in 1859–65 at a cost of £10,000, that church is a fine cruciform Gothic edifice, with a rude stone cross in the churchyard, a carved stone pulpit of 1480, and monuments to Admiral Sir Richard Leveson (1570–1605) and Colonel Lane (d. 1667), who assisted Charles II. in his escape from Worcester. Otherwise the public buildings are all modern—the town-hall (1868), in the Italian style, corn exchange (1853), market-hall (1853), agricultural hall (1863), hospital (1849), post-office (1897), art gallery (1885), drill-hall (1886), &c. A bronze equestrian statue of the Prince Consort was inaugurated by Queen Victoria in 1866; and there is also a statue (1879) of the Right Hon. C. P. Villiers (q.v.) of Corn-law fame, first returned as M.P. for Wolverhampton in 1835, and re-elected till 1898. The public park (1881), known as the West Park, was laid out at a cost of £16,000; the East Park dates from 1896. The free grammar-school, which was founded in 1512 by Sir Stephen Jenyns, Lord Mayor of London, and at which Abernethy and Sir W. Congreve were educated, occupies handsome buildings of 1876; and there are also a blue-coat school (1710) and an orphanage (1850). Sir Stephen was a native; so too was the great Mr Jonathan Wild. Bishop Pococke described Wolverhampton in 1757 as 'a great manufacturing town in all sorts of toys, and particularly of locks in the greatest perfection'; and locks—some two million yearly—are still its specialty, the Messrs Chubb's works being here. The other manufactures include tinplate, japanned goods, enamelled hollow wares, edge-tools, gas and water tubes, electro-plate, papier-maché, chemicals, cycles, motor-cycles, and motor-cars, artificial silk, electrical engineering, railway running-stock construction by the G.W.R., and other diversified trades. The town stands on the western edge of the great coal and iron mining district of South Staffordshire, and so chiefly on the southern and eastern sides are located collieries and iron-works, blast-furnaces, foundries, and many diversified industries. On the western side the famous firm of Courtaulds, Ltd., in 1926 erected huge works for the manufacture of artificial silk, to employ about 6000 hands. On the north and west there is pleasant green country—Boscobel (q.v.) is only 8 miles distant. Wolverhampton was enfranchised in 1832, returning two members to parliament (three since 1885), and it was made a municipal borough in 1848, a county borough in 1888. Pop. of parliamentary borough (1851) 119,748; (1881) 164,334; (1911) 202,053; (1921) 216,130, of whom 102,373 were within the municipal and county borough. In 1927, under act of parliament, the borough boundaries were extended, thus making possible great development on the western side.

Wolverhampton. See FOWLER (H. H.).

Wolverine. See GLUTTON.

Woman's Rights. See WOMEN'S RIGHTS.

Womb, or UTERUS, a flattened pear-shaped organ, lying in the line of the axis of the inlet of the Pelvis (q.v.), with its base directed upwards and forwards, and its narrower neck or *cervix* directed downwards and slightly backwards. In the unimpregnated condition it is about 3 inches in length, 2 in breadth, and 1 in thickness, and weighs about an ounce and a half. On laying it open its cavity is found to be very narrow, and to contain only a little mucus. Its walls are nearly half an inch

thick, and are mainly composed of muscle-cells and fibres running irregularly in all directions except round the *os*, where they make a partial sphincter. This muscular layer, which constitutes the bulk of the organ, is covered externally with a serous coat, derived from the peritoneum, and is lined internally by a mucous membrane continuous with that of the canal called the *vagina*, by which the interior of the womb communicates with the outer surface of the body. This mucous membrane abounds in small mucous follicles, and is provided with ciliated Epithelium (q.v.). The lower end of the cervix projects slightly into the vagina, communicating with it through the *os uteri externum*, which is nearly round in the virgin, and transverse after parturition. This orifice leads into a narrow canal which terminates at the upper end of the cervix in a smaller opening, the *os internum*, beyond which is the shallow triangular cavity of the womb, of which it forms the lower angle, while the two upper angles, which are funnel-shaped, constitute the beginning of the Fallopian Tubes (see under OVARY), whose apertures are so small as only to admit the passage of a fine bristle. The blood-vessels and nerves enlarge in a very remarkable way during pregnancy, so as to adapt themselves to the increased wants of the organ, which, at the ninth month of utero-gestation, weighs from 1½ to 3 lb. The term *appendages to the uterus* is given to the Fallopian Tubes and Ovaries (q.v.), which are enclosed by the lateral folds of the peritoneum called the broad ligaments. The womb is suspended in the pelvic cavity in such a way as, by its mobility, to escape rude shocks from without or disturbance from the varying conditions of the surrounding viscera, while at the same time it is able to increase vastly in bulk with comparatively little discomfort when pregnancy occurs. This is effected by several duplicatures of peritoneum, containing variable quantities of fibrous and muscular tissue, and known from their form or connection as the *broad*, the *round*, the *utero-sacral*, and the *utero-vesical* ligaments.

The uterus is an organ peculiar to the Mammalia, and in comparatively few of them (excepting the Apes and Cheiroptera) is it of the simple oval or triangular form which we have described. It is *two-horned* in the Ruminantia, Pachydermata, Solipedia, and Cetacea; and it is said to be *divided* where, as in most of the Carnivora and Edentata, and some Rodentia, it has only a very short body, which speedily divides both externally and internally, and is continuous with the oviducts or Fallopian tubes. The uterus is actually *double* in some of the Edentata, and in most of the Rodentia, including the mouse and hare; in which each Fallopian tube passes into an intestiniform uterus, which has two completely distinct openings lying near to each other within the vagina. In the Marsupiata and Monotremata the modifications of this organ are still more singular.

The chief offices or functions of the womb may be divided into those which relate to (1) Menstruation, (2) Insemination, (3) Gestation, and (4) Parturition.—For further details, see the standard works on anatomy and physiology.

DISEASES OF THE WOMB.—In consequence of its mobility, but particularly of the periodical changes it undergoes during the processes of menstruation and childbearing, the womb is an organ extremely liable to disease. It is of course quite impossible in such a work as the present to do more than indicate generally some of the more important of the morbid conditions met with and their symptoms; the more, as even a trained observer can seldom decide from the progress and symptoms of a case without a thorough examination what the nature of the disease really is.

Malformations occur as a result of imperfect development; the womb may be small or rudimentary, or it may be double throughout or in its upper part, as is normally the case in some of the lower animals.

Displacements forwards or backwards are common in consequence of the mobility of the organ. Their exact causation is not always perfectly understood; but they often lead to much pain and discomfort, to inflammation of the organ, to disturbance of menstruation, and to sterility. In many cases they may be remedied by mechanical means.

Prolapse, or displacement downwards of the womb, generally occurs in consequence of injury during childbirth. The cervix, or even the whole womb, may project from the orifice of the vagina, causing great distress and discomfort. Mechanical support, with or without previous operation, will usually give relief.

Inflammation, affecting the cervix only or the whole womb, often follows childbirth, or may result from displacement of the womb, cold, and other causes. But the most fruitful sources of it are probably neglected miscarriages; for it is not sufficiently recognised that almost as much care is required to ensure complete restoration to health after a miscarriage as after a confinement. Various forms and degrees of inflammation vary much in their results, but generally speaking they lead to abnormal discharge from the vagina (popularly called 'whites'), irregular menstruation, pain in the back and pelvis, and often to great constitutional weakness and nervous disturbance. The most suitable treatment varies much in different cases, but is often tedious and troublesome.

The womb is a very frequent seat of *tumours*. In many cases the chief symptom is excessive menstruation; but in some forms of fibroid tumour there may be such an absence of symptoms that the growth is discovered only by accident. Pedunculated tumours, or Polypi (see POLYPUS), within the uterus can generally be removed with little trouble or risk. '*Fibroid*' tumours, consisting of fibrous tissue with a variable proportion of unstriped muscular fibre, resembling that normally present in the uterus, are by far the most frequent tumours in this situation. They are most common in middle life; after the 'change of life' they usually cease to grow, or to give rise to any symptoms except those due to their mere mechanical presence. They may be of enormous size; tumours of 70 or 80 lb. have been met with. Considering their frequency, it is surprising how seldom they lead to the death of the patient; but they often cause excessive hæmorrhage and great debility. When situated near the internal surface of the womb, they are sometimes expelled spontaneously. Removal by ordinary surgical methods has often been practised in severe cases, and with steadily improving results. In 1884 Dr Apostoli of Paris brought into notice a method he had introduced of passing strong electric currents through the womb, for which he claimed that it produced diminution of hæmorrhage and practical cure in many cases without the risks of an operation. A similar result has more recently been attained by X-ray treatment.

Malignant tumours of the womb are also very common, less frequent only than in the digestive organs. In the vast majority of cases the disease begins in the cervix; and at an early stage it may sometimes be removed with success. But if not completely eradicated it speedily spreads to neighbouring parts, and a fatal result is inevitable. It is rare before thirty years of age; most common between forty and sixty. The first symptom is usually hæmorrhage; pain is rarely present in the earlier stages, and may be absent throughout.

Sarcoma is sometimes met with, but is much less common than cancer in this situation.

See also GESTATION, MENSTRUATION, OBSTETRICS, OVARIOTOMY, REPRODUCTION.

Wombats (*Phascolomyidæ*), a family of marsupial mammals, resembling in many characters the rodents. There are no canines, and the incisors are large and with enamel only on the front surface; there are only two in each jaw, growing, like all the teeth, from persistent pulps. The back teeth are ten in each jaw. The limbs are stout and short, with five toes, all provided with long curved claws, except the very short first toes of the hind feet, which are nailless. The tail is rudimentary. In their general form and actions the wombats resemble small bears, having a similar shuffling plantigrade walk; but they are even shorter in the legs and broader in the back than those animals. They live on the ground and in burrows or holes among rocks, feeding on roots, grass, and other vegetable substances. They sleep in the day, seeking their food at night, and are usually gentle in their habits, though their large chisel-like incisors enable them to bite strongly if provoked. There is one existing genus, containing three species. The wombats of Tasmania and the islands of Bass Strait (*P. ursinus*) and the larger species (*P. mitchelli*) of the southern mainland of Australia have rough and coarse fur, a smooth muzzle, and short rounded ears. The larger species

Wombat (*Phascolomys latifrons*).

is very variable in colour, ranging from pale yellowish brown to black. *P. ursinus* is brownish gray, like the third species, the Hairy-nosed Wombat (*P. latifrons*), which differs from the other two in having smooth silky fur, a hairy muzzle, and large pointed ears. It inhabits Southern Australia. The largest living wombat (*P. mitchelli*) is about 3 feet long, but the remains of a much larger extinct genus have been found in Queensland.

Wombwell, a town and urban district of the West Riding of Yorkshire, 4½ miles SE. of Barnsley. Pop. 19,000.

Wombwell, GEORGE (1778–1850), originally a London bootmaker, became a noted founder and proprietor of menageries.

Women's Rights is the name originally given by promoters—though in early days perhaps more frequently used by opponents—to the movement of women towards personal, proprietary, and political freedom. This movement was called by George Meredith 'the most indigestible fact of our century.' The social, legal, and economic changes which it implies have nowhere been completely worked out; the process has been begun, and is in a different stage towards completion in every country of progressive civilisation. The largest strides towards complete freedom for women have been made in the English-speaking and the Scandinavian countries; but a powerful impulse was given to it in Central Europe by the revolutionary outburst which accompanied the overthrow of the Hohenzollern and Hapsburg dynasties in 1918. The movement has made a really remarkable advance in India, on political as well as on educational, professional, and social lines. It has also made considerable progress in the Near East, especially in Turkey and Egypt: and a small beginning has been made in Palestine, since the confirmation of the British mandate by the League of Nations in 1922; e.g. a real demand has grown up among high-class Moslems for the education of their girls; and the Hebrew university inaugurated by Lord Balfour in 1925 has been from the outset completely open to both sexes. On the other hand, however, it was learned, during the rescue work which followed the disastrous earthquakes in Palestine in July 1927, that in Nablus, a fanatically Moslem town, there were women in harems who had not been out of their own houses for forty years. It would, however, be obviously impossible in the space allotted to this article to trace the movement with any degree of completeness in the various countries largely affected by it. Attention will therefore here first be drawn to the general causes which have given rise to the movement and account for the universality of its operation, and then to a brief outline of its recent development in Great Britain.

Sir Henry Maine points out in *Ancient Law*, and also in *The Early History of Institutions*, that this change is really part of a far larger movement—viz. the gradual emancipation of the individuals forming the family group from the absolute control of the head of the family. In patriarchal times every individual in the family group was completely subject to the *patria potestas;* sons, servants, children, wives could hold neither property, liberty, nor life except at the good-will and pleasure of the head of the family. The subordinate members of the family had no rights, no responsibilities, and no duty beside obedience. Little by little the absolute rule of the head of the family over the various members of the family group was encroached upon. The first step was a recognition of different kinds and degrees of power; at first the patriarchal power was identical in character over the whole of the persons and possessions of the family. The power over flocks and herds was not more absolute than that over sons, slaves, or wives. In the gradual development of modern society all the members of the family group have emancipated themselves from the absolute control of the head of the family. The emancipation of women proceeded more slowly than that of the other members of the family group; but the germ of it has been present from the dawn of history, and has been more or less widely recognised and developed in all progressive societies. Sir Henry Maine attributes in a very large degree the difference between the then stagnant civilisation of the Hindu races and the progressive civilisation of races influenced by Roman institutions to the fact that the latter have steadily relaxed the subjection of women, while the former have recoiled, until quite recently, from these changes, and have used the combined authority of religion and law still further to complete the seclusion and subordination of the female sex.

Legal Changes.—The movement towards the emancipation of women is one from status to contract. 'The movement of progressive societies has been uniform in one respect. Through all its course it has been distinguished by the gradual dissolution of family dependency, and the growth of individual obligation in its place. The individual

is steadily substituted for the family, as the unit of which civil laws take account' (*Ancient Law*, p. 168). The most casual observer is aware that very much was done in this direction so far as women were concerned in Great Britain during the 19th and 20th centuries (Summary Jurisdiction (Separation and Maintenance) Act, England and Wales, 1925). The husband no longer acquires by the mere fact of marriage control over the property of his wife (Married Women's Property Act, 1882); certain limited rights of guardianship over her children were secured to her by law (Guardianship and Custody of Infants Act, 1886), and were further developed by the Guardianship of Infants Act, 1925. Formerly all the children of a marriage were wholly under the control of their father, the mother possessing, even after the death of her husband, no authority except as his deputy. By the abolition of imprisonment (by an act passed in 1884) as the punishment for refusing an order of court for the restitution of conjugal rights, a wife's right to have control of her own person has been established. Minor alterations of the law, such as that which improved the legal position of the wife in case of the intestacy of her husband, or in the event of desertion by him, &c., are of tolerably frequent occurrence. The movement for many years was not rapid, but it was all in one direction. It was like a glacial drift. No one could see it move, but after an interval, comparing it with a stationary object, proof was forthcoming that it had moved; and it always moved in one direction, that of increasing the personal and proprietary independence of women. The closing years of the 19th century and the opening of the 20th witnessed an acceleration in the pace of the movement. The reasons for this are both economic and political. If we examine the economic reasons, they are to be found in the changes accompanying the application of steam and labour-saving appliances to manufactures. The immense development of manufacturing as contrasted with domestic industries has laid the foundation of economic independence for the great mass of working women. When a woman worked as a member of a family group, the result of her labour belonged not to herself but to her father or her husband. When a woman works in a factory her wages are her own property; she has passed from family dependency to self-dependency. The difference is not so much that working women work more than they did: the great mass of people must always work in order to live; but the result of their labour in the shape of wages forms a fund over which the worker now has the sole control, whereas in earlier times all she produced belonged to another, who in return certainly allowed her board and lodging, but believed himself to be doing so out of his own property, and not out of hers. Even now the domestic work of women is not often esteemed at its proper economic value. In an average working-class family the man is usually called the 'bread-winner.' He would say in perfect good faith that he 'kept his wife and family'; although the working-class mother, if she is an industrious woman with an average family, leads a life of almost incessant toil for their benefit. The woman who cleans, sews, cooks, and washes for a man and six children 'keeps' the family quite as essentially as the man who turns a lathe or ploughs the land, and thereby brings in a weekly sum of money to the family purse. The value in money of women's work in a factory has already caused a more general recognition of the value in money of women's domestic work. Its value in a sense that is beyond all money, if she does her duty to her children, fortunately stands in no need of emphasis.

The view that the recent rapid development of the Women's Rights movement rests on an economic basis receives confirmation from the fact that the greatest progress towards the independence of women has been made in those countries such as Great Britain, the United States, and Scandinavia, which have been foremost in adopting modern economic changes, e.g. labour-saving machinery, in industry. Countries that are most backward industrially are also most backward in raising the condition of women. Where the industrial development of a country offers the opportunity of economic independence to women, social independence with all its various ramifications makes rapid progress; education, entrance into the professions, wider opportunities of work, of knowledge, of enjoyment, a share in public life and political liberty are demanded, and in Scandinavia, the United States, Britain and most of her colonies have been secured.

Literary Expression of Demand for Political Liberty.—The first fully conscious demand on the part of women in England for education, for employment, for political liberty, is to be found in Mary Wollstonecraft's *Vindication of the Rights of Women*, published in 1792. During the 19th century the question never slumbered; the foremost minds of the time dealt with it and led it. From the somewhat erratic but brilliant and meteor-like championship of Shelley, the great literature of the century never ceased to concern itself with the women's rights question. *Aurora Leigh* is an essay on women's rights which touched the relation of men and women at its very foundation with a master-hand and fearless decision. That it was recognised in this character by some at least of the opponents of women's rights is evident from Edward FitzGerald's outburst on the occasion of Mrs Browning's death: 'No more Aurora Leighs, thank God! A woman of real genius, I know; but what is the upshot of it all? She and her sex had better mind the kitchen.' Tennyson could not keep his pen from women's problems, and in *The Princess* dealt with them in a sympathetic spirit to the disgust and astonishment of his friend FitzGerald. The works of the Brontë sisters, especially Charlotte Brontë's *Shirley*, are full of the working of the ferment of women's rights. The same may be said of nearly all George Eliot's writings, of innumerable passages in Thackeray's, and continues to be true of the literature of our own times; and many of the women who denounce the movement are as much its products as those who sympathise with it. It is true we could not have had a Mrs Browning, a Mrs Somerville, a Harriet Martineau, a Miss Nightingale, or a Mrs Sidney Webb without the women's rights movement; but neither could we have had a Mrs Humphry Ward, or a Miss Gertrude Bell, if the women of our time had still been condemned to

> A sort of cage-bird life, born in a cage,
> Accounting that to leap from perch to perch
> Was act and joy enough for any bird.

Employment.—The opening of ordinary industrial employments which was brought about by large economic forces affecting the whole of society must be regarded not as a product of the women's rights movement, but as the principal material cause of its rapid development. Supplied with that motive power, the momentum acquired has been sufficient for many conquests. Many employments and professions, such as medicine and the law, have been opened to women; the lady journalist has made a position; many salaried appointments under government have been opened to women, and women have become factory inspectors, members of trade boards, supervising officers in the labour exchanges, school inspectors, &c.; they hold

important offices under the Ministry of Health and the Post-office. Local authorities also show an increasing readiness to entrust women with highly responsible work. When the League of Nations was formed in 1919 all offices under it were opened to women as well as to men. Very few, it is true, have been actually appointed, but it is significant that women were from the outset made eligible for every position. In England women are now frequently chosen as mayors of important boroughs, such as Cambridge, Norwich, and Colchester; and in 1927 Viscountess Cowdray, was elected to act as high steward of the last-named town—the first time that this office had been held by a woman. Women now hold important posts under the London and other county councils. These changes were facilitated and hastened by the passing in 1919 of the Sex Disqualification (Removal) Act, which opened both branches of the legal profession to women, and qualified them to sit on juries and to act as magistrates. 'A person shall not be disqualified by sex or marriage from the exercise of any public function, or from being appointed to or holding any civil or judicial office or post, or from entering or assuming or carrying on any civil profession or vocation, or for admission to any incorporated society (whether incorporated by royal charter or otherwise), and a person shall not be exempted by sex or marriage from the liability to serve as a juror.' This act also made it clear to the universities of Oxford and Cambridge that they were free to open membership, degrees, prizes, and other privileges to women. The Representation of the People Act, 1918, extended the parliamentary and local franchises to women and placed about eight and a half million women on the parliamentary register; it also multiplied the number of women local electors from about one million to between eight and nine millions. After this the Parliament (Qualification of Women) Act, 1918, rendered the election of women to the House of Commons a possibility. No work was required to get the act passed; it was all but unopposed. But, owing to the very short time between the passing of the act and the general election of 1918, there were very few women candidates, and only one woman, in Ireland, was elected. Since 1918 no parliament in Great Britain has been elected without returning some women members. The enfranchisement of women had an immediate and almost startling effect on social questions in parliament. The Bastardy Laws Amendment Act of 1872, England and Wales, which had fixed at 5s. a week the maximum sum which a father, whatever his wealth, could be made to pay for the support of an illegitimate child, was at once amended, and the sum raised to 10s.; this sum was subsequently raised by a further act to 20s. Other instances might be cited of the effect of women's franchise on women's general position and status, such as the Matrimonial Causes Act, 1923, England and Wales, which provides that a wife may divorce her husband on the same grounds as a husband his wife. Pensions for women (Widows', Orphans', and Old Age Contributory Pensions Act, 1925) are now granted on equal terms to men and women. It is difficult to remember that when the first National Health Insurance Act came into operation in 1912, the maternity benefit granted under it was paid to the father and not to the mother. This absurdity would, of course, have been impossible if women had then possessed the parliamentary franchise. For further details see *What the Vote Has Done*, an eight-page leaflet issued by the National Union of Societies for Equal Citizenship, 15 Dean's Yard, London, S.W. The changes just mentioned very largely extended the area of women's work; at the same time its quality greatly improved. There are occupations which have been in women's hands from time immemorial, such as nursing and teaching; these have been virtually re-created and a wholly new spirit breathed into them by the improved national status of women.

The Position of Women in the Churches—Church of England.—In the early sixties of the 19th century the Church of England revived the ancient order of deaconesses, and in nine dioceses, including those of London, Salisbury, and Winchester, deaconesses' houses were opened, and Archbishop Tait, then (1862) bishop of London, ordained Elizabeth Ferard as deaconess. The Lambeth Pan-Anglican conference of 1920 declared 'that in our judgment the ordination of a deaconess confers Holy Orders'; and a joint-committee of Convocation in 1923 adopted a resolution which declared that 'the order of Deaconesses is an apostolic order of ministry in the Church of God, and that the women admitted thereto are episcopally ordained.' Notwithstanding this, little practical progress has been made except that in 1924 a service was drawn up for the ordination of deaconesses which was incorporated in the first draft of the revised Prayer-book, but was later taken out; and it appears that the only branch of the Church of England in which deaconesses are ordained with a service similar to that observed in the case of men is the infant church of China.

Although no definite steps have been taken to carry into practice the resolution adopted at the Lambeth conference of 1920, individual bishops and clergy have shown themselves willing from time to time to exercise their right to invite women to preach, and Lady Barrett and Miss Maude Royden have respectively responded to such invitations in Bristol and Liverpool cathedrals. But the position of women in the Church of England is this: they do very important and valuable church work, such as looking after the sick, caring for children, raising up those who have fallen; but these services have not been followed by formal recognition admitting them to any form of holy orders.

The Free Churches.—The Unitarians, Congregationalists, and Baptists have definitely opened their ministries to women, while the Wesleyans and Presbyterians have as definitely declared against doing so.

Though in important respects the foregoing is disappointing as showing timidity and hesitation where one might have looked for courage and faith, there are signs of a considerable advance of opinion in the body of church membership, and the ministry of women is welcomed in those cases in which the individual woman offering it has proved herself able and faithful in the work she has undertaken. It has been one of the very strong points in the organisation of the Salvation Army that it has given equal opportunities of service to men and women.

Education.—The new fields of professional occupation for women had been rendered accessible by the immense improvement which had taken place in their education during the 19th century. Education for girls and women not inferior in quality to that provided for boys and men has been successfully struggled for. Queen's College (q.v.), London, opened in 1848 through the initiative of the Rev. F. D. Maurice and Dr (afterwards Archbishop) Trench, was the first attempt to provide university education for women in England. Bedford College, London, was the next to follow. The national importance of girls' education was recognised by including girls' schools in the purview of the Schools Enquiry Commission, 1864. The doors of the older universities were knocked at a few years later when Miss Emily Davies (1830–1921)

organised a petition to the university of Cambridge to open its local examinations to girls. This prayer was granted in 1865, and was the first recognition in England that the universities have duties in regard to women's education. While Miss Davies was working to create a college for women in Cambridge, Miss A. J. Clough (1820–92) and Mrs Josephine Butler (1828–1907) were founding the North of England Ladies' Council of Education, which provided in many local centres lectures for women of a university standard. The aims of these two groups, while superficially different, were essentially similar; and they both showed that there was a real demand for university education for women. Out of this demand sprang two important developments: (1) the university extension movement, with its corollary in the universities and university colleges now existing in nearly all the most important centres of population throughout the kingdom, and (2) Girton College (q.v.) and Newnham College (q.v.), the one opened in 1869, the other in 1871. In 1881 the Cambridge senate passed a grace by an overwhelming majority (258 to 26) to open their honours examinations to women students of Newnham and Girton, without, however, conferring the degree upon them. Oxford followed Cambridge, though not upon identical lines, for Oxford opened its degrees, scholarships, and prizes to women in 1921, while Cambridge had rejected in 1897 the proposal to grant degrees to women, and for some years made no advance towards a more favourable position for its women students. But new statutes which came into force in October 1926 through the recommendation and labours of the Universities Commission made it possible for the first time for women to take part in the educational work of the university; and through the generous spirit in which these statutes have been interpreted, a considerable number of women have been appointed as university lecturers. Cambridge women have also been made eligible for university scholarships and prizes. But nearly 40 years earlier, in 1892, the four Scottish universities were completely opened to women. Durham opened its degrees in 1895. London University opened its examinations and degrees in 1878, and when it was reconstituted as a teaching university in 1900, Bedford College, King's College for Women, the Royal Holloway College, Westfield College, and the London School of Medicine for Women were recognised as schools of the university. All the newly founded universities in England, Ireland, and Wales have admitted women to positions of equality with men. Of the older universities Trinity College, Dublin, in 1903, opened its classes, degrees, and prizes to women, and moreover offered *ad eundem* degrees to women who held degree certificates from the vice-chancellors of Oxford and Cambridge. Meanwhile secondary education for girls had been undergoing a revolution not less searching than that which has converted the ignorant and gin-drinking Mrs Gamp of former years into the trim, deft-handed, certificated nurse of to-day. What Florence Nightingale and her coadjutors did for nursing and nurses, Mrs William Grey, Miss Shirreff, Miss Buss, Miss Beale, and others did for the teachers and the taught in girls' schools. The result of improving the education of girls and women has been the overthrow of many cherished convictions, or rather prejudices formed without knowledge, on the limitations of the female intellect. Women have shown themselves capable of benefiting by the highest kind of instruction which a university can afford, and the blue ribbon of the various examinations has not infrequently been won by a girl student. The result has been that a far larger number of women have engaged in scientific pursuits, in historical, archæological, and classical research. Of the direct value of their work in increasing the sum of human knowledge experts alone have a right to form an opinion; but of the advantages to the women themselves and to the society of which they form part there can be no doubt.

A further social benefit has accompanied the opening of various avenues of work to women; it has increased the opportunities of comradeship and multiplied the bonds of friendship between men and women. The number of points at which their lives touch and run in unison has been increased. There are links of sympathy between them in the study as well as in the kitchen and nursery.

Medical Education.—A few words must be given to the successful struggle on the part of women to obtain medical education and an equal status with men in the medical profession. Dr Elizabeth Blackwell (q.v., 1821–1910) was the first woman upon the British medical register. She was placed upon the register in 1859 in virtue of a foreign degree (Geneva, U.S.A.). Later on foreign degrees ceased to give their owners a claim to be placed on the British register, and the second Englishwoman who desired to study and practise medicine had to enter by another door. Miss Elizabeth Garrett, later Mrs Garrett Anderson (q.v., 1836–1917), M.D., began her work of opening the medical profession to her own sex in 1860. After much effort and many repulses from various licensing bodies, she discovered that the Society of Apothecaries had no power under their charter to exclude her. She obtained their licence and was placed on the register in 1865. This entrance for women into the profession was almost immediately afterwards closed. Every licensing body in Great Britain and Ireland sturdily opposed the entrance of women into the profession. Many years of unremitting effort followed: in Edinburgh an extraordinary degree of acrimony was manifested by the opponents of the women students. All means of getting upon the British register being for the time closed, women continued to get their medical education abroad—in Paris, Brussels, Zürich, &c.—and returned to practise in England. A women's dispensary and hospital were opened in London with a staff of women physicians and surgeons; then followed the foundation of a medical school for women, mainly through the exertions of Dr Sophia Jex-Blake and of Dr Elizabeth Garrett Anderson; and it was not long before similar schools were started in Edinburgh, Glasgow, Dublin, Belfast, and Cork. In 1876 an 'Enabling Bill' was passed through parliament under the guidance of Mr Russell Gurney. This bill empowered all the licensing authorities in Great Britain and Ireland to open their examinations to women if they were so disposed. The first examining bodies to avail themselves of this power were the King's and Queen's College of Physicians, Ireland (now the Royal College of Physicians and Surgeons), and the Queen's University, Ireland. They were followed (in 1878) by the London University, and no legal hindrance any longer obstructs the entrance of women into the profession. The change that has since that time taken place in the view of the majority of medical men with regard to women doctors is illustrated by the fact that while in 1877 the British Medical Association at its annual meeting passed a resolution declaring in future all women to be ineligible as members, in 1892 the same body rescinded this resolution by the enormous majority of 600 to 4. In 1909 the Royal College of Surgeons and the Royal College of Physicians opened their diplomas to women; and the Royal Society of Medicine, founded in the same year, was from the outset open to women on exactly the same terms as to men.

Moral Aspect of Subject.—No account of women's rights would be complete which did not touch upon the great struggle against the worst of women's wrongs, the forcible subjection of women to the lowest animal instincts of men. In some countries women of a certain class are treated like cattle, and are absolutely at the disposal of the wretches who farm their destruction for their own pecuniary profit. White slavery is a term that but feebly indicates the horrors of the system. There are men in nearly every country who use their command of wealth, of physical strength, of mental subtlety to subdue a woman to their vicious instincts, and then despise her for being what they have made her; they execrate her for not having what they have robbed her of. The legal position of women of this class has never been so terrible in England as in France and other Continental countries; but an attempt was made in 1866 and in 1869 by what were known as the Contagious Diseases Acts, to introduce part at least of the Continental system into the English garrison towns. The acts were passed and were in operation for twenty years, but throughout these twenty years an unceasing and most active agitation was kept up for their repeal, led with persistent courage and skill by Mrs Josephine Butler (1828–1906). The acts were repealed under the parliamentary leadership of the Right Hon. Sir James Stansfeld (1820–98) and the Right Hon. James Stuart (1843–1913) in 1886; they have since that time been condemned by the medical profession at congresses—Brussels in 1891, 1899, 1902, and in London in 1914—as completely useless from the hygienic point of view; but this was not the motive power which brought about their repeal. This was supplied by the steadfast resistance of the women of England, led by Mrs Butler, to the doctrine that vice was necessary for men, and being necessary the state was bound to provide, at the expense of the personal liberty of the women sacrificed to it, that it should be as little dangerous as possible. Two Royal Commissions, one in 1871, and the other in 1913, have dealt with the subject of the control and reduction of the incidence of venereal disease. There were no women on the first: on the second there were three. On the first the general uninstructed opinion was that the system embodied in the acts was the best, or perhaps the only, way of preventing these diseases and of protecting their victims, some of whom were, of course, innocent children. On the first commission in 1871 an important group of the commissioners were converted from being supporters to convinced opponents of the system; and the experience gathered between 1871 and 1913 was so overwhelming that the acts were completely useless from the hygienic point of view, that the terms of reference of the second commission precluded any return to the system of the acts. The main recommendation of this second commission lay in the provision of means for early and adequate diagnosis and treatment for all infected persons (see Report on Venereal Diseases, by Dr R. W. Johnstone, medical officer of the Local Government Board, 1913). The adoption by the public health authorities of this method has been followed by a remarkable reduction of these diseases. The strength of Mrs Butler's position as a root and branch opponent of the acts has been amply justified by subsequent scientific inquiry; see the great work of Abraham Flexner (Rockefeller Foundation) on *Prostitution in Europe* (1917), and again more recently in the report of a special body of experts, among whom was Mr Flexner, on the Traffic in Women and Children, published by the League of Nations in February 1927.

Directly growing out of Mrs Butler's work, other reforms have been forced in this country, on a not too willing legislature, with the object of giving greater protection to women and girls from the vicious and mercenary instincts of depraved men and women. In 1885 the age of consent was raised from thirteen to sixteen; and many offences against women, not formerly recognised as such by law, were made criminal. Much has been done in this field towards the reparation of the wrongs of centuries, but a great deal still remains to do.

Women in Local Government.—Women made good their position in local government long before any approach to political equality was granted to them. The local government franchise was opened to women in 1870. The right to vote carried with it the right to be elected, and large numbers of women were elected, and did good work as poor-law guardians. Their efforts almost immediately led to material improvements in poor-law administration, especially as regards the care of children and invalids. The Education Act of 1870 made women eligible as members of school boards, and women were elected in London, Manchester, Edinburgh, and other important towns. The choice of women as candidates for election was then limited in a very undesirable way by the regulation which had been made when only the candidature of men was in contemplation, that only those who were themselves voters were eligible. In the case of women this meant that no wife living with her husband and no daughter living with her parents could be elected. It took many years of hard work to get this difficulty removed. But the Women's Local Government Society at length succeeded, in 1907, during Sir Henry Campbell-Bannerman's premiership, in getting the law altered so that residence in the locality should be a qualification and not necessarily 'occupation' in the technical sense of the term. Reference to this in the King's Speech affords, it is believed, the only example in the history of British parliamentary institutions where an extension of the liberties of women has occupied this position. This change in the law very largely increased the number of women offering themselves for election. Women poor-law guardians quickly rose in number from 160 to over 1300. Women's position in local government was greatly strengthened by the provision in the Representation of the People Act, 1918, which extended the local government franchise, which had hitherto been confined to women 'occupiers,' to those women also who were the wives of occupiers. This change increased the number of women electors on the local government register about sevenfold.

Women's Parliamentary Suffrage.—Women's suffrage was first raised in parliament as a practical political issue in 1867, when John Stuart Mill (1806–1873), moved an amendment to the Reform Bill of that year. It was, of course, defeated; but 73 members voted for it, including ten leading Conservatives. Mill's speech made a very deep impression, and not in England only. Lady Frederick Cavendish in her diary (edited by Mr John Bailey), Vol. II. p. 22, 15th January 1867, writes: 'The subject of female suffrage (odious and ridiculous notion as it is) is actually beginning to be spoken of without laughter and as if it were an open question.' It is not improbable that the passage here quoted reflected the then prevalent view of the subject in official Liberal circles. Non-party societies in support of women's suffrage sprang into active existence in different parts of the country, and received a remarkable degree of support. On seven occasions (in 1870, 1886, 1897, 1908, 1909, 1910, 1911) women's suffrage bills passed their second reading in the House of Commons, but made no further progress. The new House elected in 1906 contained 426 members pledged to support

women's suffrage; but the government gave no sign of any official support. The position was not creditable to the House of Commons. Sir Edward (now Viscount) Grey, then foreign secretary, commenting on this in June 1911, said, 'It is a very serious matter that the House should year by year have been getting itself into an invidious and discreditable position by passing second readings of a bill and not showing whether it is determined to proceed with it.' The intense irritation caused by this position, coupled with the fact that Sir Henry Campbell-Bannerman, when prime-minister, had told a deputation of suffragists that they had made out a 'conclusive and irrefutable case,' but that he could do nothing for them except to advise them 'to go on pestering,' led to the outbreaks usually described as 'militancy.' This, in its turn, was irritating and estranging to public opinion, and without the support of public opinion victory was impossible. It was during the temporary setback caused by these events that the only defeats for many years past of women's suffrage by a vote in the House of Commons took place in 1912 and 1913. While militantism became more and more aggressive, the non-militant suffragists became more and more convinced that it was vital to their movement to make their appeal only to the commonsense and experience of their fellow-citizens and not to attempt to gain their political object by physical violence. To do this, they held, was to deny their faith to make their faith prevail. Nevertheless impartial onlookers could not but admit that any body of men who had been treated politically as the suffragists had been treated would have shown a far more dangerous kind of violence than the little band of 'militants' had displayed, and that while their methods were in the highest degree irritating and annoying they had shed no blood, and no human being or animal had suffered either in life or limb by their deeds. It would be difficult to point to any other revolutionary movement (for such theirs was in method though not in aim) of which the same could be said.

Then suddenly, in 1914, came the world war, and instantly everything was changed. The largest of the suffrage organisations, the National Union of Women's Suffrage Societies, at once suspended political activities, and devoted their big organisation and their experience in team-work to helping their country. The 'militants' immediately dropped every kind of violence. Many of them joined what was known as the Women's Emergency Corps, and undertook much useful national work.

The N.U. societies devoted themselves to different forms of war work too varied for enumeration here. Their chief task originated in Scotland, and was devised and carried out by the honorary secretary of the Scottish Federation, Dr Elsie Inglis. This was the creation of the Scottish Women's Hospitals for Foreign Service. These were vigorously supported by the whole N.U. Refused recognition at the outset by the British Red Cross, the S.W.H. placed themselves under the French Red Cross, and the hospitals at Royaumont, Troyes, Salonika, and in Serbia, officered entirely by women, earned the devoted gratitude and amazed appreciation of our Allies. More than £429,000 was raised by the N.U. during the war for carrying out this work. In 1915 the needs of the nation broke down the trade union rules for the exclusion of women from the skilled trades, and millions of the industrial women of the country threw themselves with wonderful zeal and efficiency into national work which had hitherto been closed to them. Abundant testimony poured in as to the high productivity of women's labour and also as to its excellent quality. These things combined to bring about wholesale conversions to the cause of women's enfranchisement, and when it became evident that a new register of parliamentary electors, with a new qualification for men, was an urgent necessity from the purely masculine point of view if the best men in the country were not to be deprived of their parliamentary vote, suffragists discovered that ninety-nine hundredths of the opposition to their movement had vanished; their greatest opponents had become their friends. The Speaker's conference on electoral reform, appointed in October 1916, reported in January 1917, and recommended that some form of parliamentary franchise should be extended to women. Mr Lloyd George had just become prime-minister, and he lost no time in acting upon this recommendation. On 28th March Mr Asquith, once the most formidable parliamentary opponent of women's suffrage, moved in the House of Commons that legislation should be promptly introduced on the lines recommended by the conference. The ensuing debate turned very largely on the question of women's suffrage. Mr Asquith acknowledged a complete change of view. Every leader of every party in the House spoke in support of the motion and in favour of the inclusion of women. An amendment was moved on hostile lines; but it was defeated by 341 votes to 62, and on the main question being put it was agreed to without a division. Thus ended practically the greatest political issue for which women had struggled for half a century. The other stages of the bill went through the Commons by triumphant majorities, and when the House of Lords was reached, 10th January 1918, Lord Curzon (1859–1925), the leader of the House, and president of the Anti-Suffrage Society, in view of the immense majorities by which women's suffrage had been adopted in the Commons, announced his intention of not going into the lobby against it, and women's suffrage was accepted in the Upper House by 134 to 71; the royal assent was given on 6th February 1918 (see above).

See Mary Wollstonecroft's *Vindication of the Rights of Women;* John Stuart Mill, *The Subjection of Women;* Helen Blackburn, *Record of Women's Suffrage;* Mrs M. G. Fawcett, G.B.E., LL.D., *Women's Suffrage: a Short History of a Great Movement, The Women's Victory and After;* Emily Davies, LL.D., *Questions Relating to Women;* Dr Elizabeth Blackwell, *Pioneer Work in Opening the Medical Profession to Women;* Lady Frances Balfour, *Dr Elsie Inglis;* G. W. and L. A. Johnson, *Josephine Butler;* A. Flexner (Rockefeller Foundation), *Prostitution in Europe;* Lady Constance Lytton, *Prison and Prisoners;* Sylvia Pankhurst, *The Suffragette; Letters of Constance Lytton,* edited by Lady Betty Balfour; report of the special body of experts on the Traffic in Women and Children, published by the League of Nations in 1927.

Wonders, Seven. See SEVEN WONDERS.

Wood in the sense of Xylem has a wider connotation than it has in common parlance. It is found not only in 'woody' plants, but also in herbaceous types of flowering plants and in Vascular Cryptogams (ferns, &c.). As in human society there is an obvious distribution of labour among its members, so in the community of cells which constitute the plant body there is a high degree of specialisation in the functions which various cells and tissues perform. The xylem of plants serves three main functions, namely: (1) To conduct water from the roots to the leaves; (2) to store food material; and (3) to give rigidity to the plant.

If microscopic sections be cut through a growing point, i.e. the tip of a branch, of an ordinary dicotyledonous tree (e.g. an Oak) and examined under the microscope they will be seen to consist entirely of thin-walled cells which during the period of active growth divide and form new cells. As the

tissues are traced down to maturer parts of the stem one observes a distinct differentiation into three zones, the epidermis (fig. 1, external circles), primary cortex (fig. 1, C), and central cylinder or stele which occupies the centre of the stem. Some distance behind the growing point and towards the outside of the central cylinder there appear certain strands of elongated cells—the procambial strands. Viewed in cross-section they are arranged in a circle and later develop into what are known as vascular bundles (fig. 1, I., shaded portions). These bundles are not contiguous, being separated by radiating strands of tissue known as the primary medullary rays. The circle of bundles, moreover, surrounds a core of thin-walled tissue which constitutes the so-called pith (fig. 1, P). Each bundle is differentiated into two well-defined areas, separated by a narrow arc of cells and lying on the same radius—an outer which is the primary phloem or bast (fig. 1, I. *b* and II. *b*), and conveys food materials elaborated in the leaves to various parts of the plant as required, and an inner which is the primary wood or xylem (fig. 1, II. *w*). Similar bundles which are found in the leaves and are responsible for the venation are continuous with those in the stem, and so essential intercommunication between the stem and leaves is established. A similar vascular tissue, also continuous with that in the stem, likewise traverses the roots, though the relative distribution of phloem and xylem is different. We have, therefore, throughout the plant a unified vascular system.

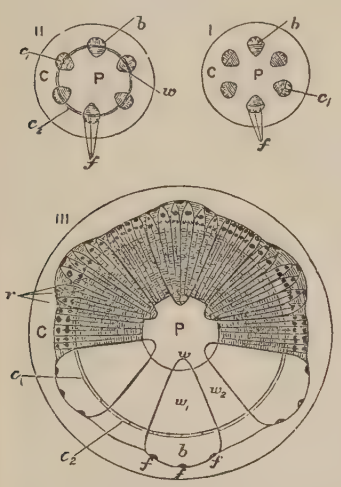


Fig. 1.—Diagram of ordinary growth in thickness, with the development of a compact woody mass. Nos. I., II., III., the same transverse section at different stages in order of age: I., before the formation of the cambium between the bundles; II., after its formation; III., after the cambium has been active for some time: Everywhere, C, cortex; P, pith; *b*, bast; *w*, wood of the vascular bundles; *f*, *f*, *f*, three groups of fibres of bast; c_1, cambium of the original bundle: c_2, cambium formed between the bundles; w_1, wood formed from the cambium of the bundle; w_2, wood formed from the cambium between the bundles; *r* medullary rays. (After Sachs.)

If a cross-section of the stem be taken at a certain level below the tip and examined microscopically, it will be seen that a few cells at the outer and inner margins of each procambial strand have become differentiated into permanent phloem and xylem cells respectively. Similar sections at progressively lower levels reveal a gradual increase in the number of such permanent phloem and xylem cells as one recedes from the tip, the successively-formed phloem cells appearing to the inside of those already differentiated and the younger xylem cells in gradual succession outwards from those first developed. The differentiation of the phloem of the bundle is therefore centripetal, and that of the xylem centrifugal. The first-formed xylem cells are collectively known as protoxylem, and those formed later as metaxylem. Differentiation of the bundles into the two types of tissue mentioned, however, remains incomplete, and a thin layer of primary meristem (or dividing tissue)—the so-called fascicular cambium (fig. I, I. c_1 and II. c_1)—persists and so separates the last-formed phloem or bast from the last-formed xylem cells. Bundles in which a cambial layer persists are capable of producing secondary growth, as described below, and are therefore known as open bundles.

This, then, is the condition (Fig. 1, I.) of things before the secondary growth of the stem in thickness commences. At this stage it will be appropriate to examine in greater detail the young xylem tissue. Changes have already taken place in the cellulose cell walls. Those of the metaxylem in particular have become strongly lignified or woody. This change is due to the impregnation of the walls with lignin, a substance which is present in all woody tissue.

Moreover, the xylem is composed of various types of elements, whose distribution and number vary in different plants.

(1) *Vessels* (fig. 2, *v*; and STEM, fig. 2, *i* and *l*). Conspicuous in the bundles are elements known as vessels. They are compound structures, and consist of long, open channels, formed by the absorption, wholly or in part, of the cross walls in a series of superposed cells.

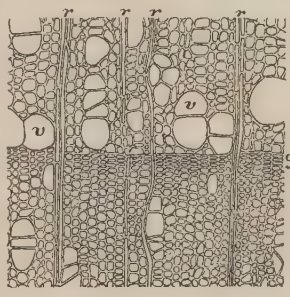


Fig. 2.—Transverse section of the wood of *Rhamnus Frangula* (highly magnified): *g*, the autumn wood of an older annual ring; *v*, vessels in the spring wood of a younger ring; *r*, medullary rays. (After Rossman.)

On the inside of the walls of the vessels of the protoxylem one finds spiral or annular thickening (fig. 2, *l* at STEM), which prevents the collapse of the elements while their walls are still extending. As one advances outwards from the protoxylem, vessels with other kinds of internal markings make their appearance. These are in some cases reticulate and in others pitted (STEM, fig. 2, *i*.). The vessels conduct water, and owing to their relatively thick walls add strength to the axis.

Fig. 3.

(2) *Tracheids* (fig. 3, 2). These are elongated cells with somewhat pointed ends. They also serve to conduct water and increase the rigidity of the stem. They are, as will be seen later, readily distinguished by the type of markings on their walls.

(3) *Parenchymatous cells* (fig. 3, 3 and STEM, fig. 2, *k*). A typical parenchymatous cell is one whose length and breadth are approximately equal. In woody tissue, however, they become somewhat elongated. They occur in vertical series and have prominent cross walls. They serve as starch repositories.

(4) *Wood fibres* (fig. 3, 1), are elongated, sharply tapering cells with strongly developed walls. Their chief function is a mechanical one. Elongated pointed cells such as tracheids and fibres are sometimes spoken of as prosenchymatous cells.

The primary condition described above soon becomes modified by the secondary growth of the stem in thickness. Certain cells in direct line with the fasicular cambium and running tangentially across the medullary rays assume meristematic activity. They unite with the fascicular

cambium to form a continuous layer constituting a complete meristematic ring. The portion of this ring traversing the medullary rays is known as the interfascicular cambium (Fig. 1, c_2). It should be appreciated that only on the cross-section does the cambium layer appear as a ring. It is in reality a cylinder or a sheath, surrounding at first the primary wood, the pith and parts of the primary rays. The modifications induced by the cambial activity are most apparent in the bigger plants, which also produce the greatest volume of wood, and to a consideration of the secondary growth in trees attention will now be directed.

The cambium, while itself remaining narrow, by the division of its cells gives rise towards the outside to new cells which are added to the rind and towards the inside to elements which form additional layers of wood (fig. 1, III. ; and STEM, fig. 1), and which become differentiated to meet the varied needs of the plant. In a temperate climate this meristematic zone becomes dormant during the winter, but resumes its activity in the growing season, adding year by year new woody tissue to the existing wood cylinder, and separating more and more the primary phloem from the primary wood, and in time modifying beyond recognition the original condition as described in the young stem. If a cross-section of the bole of any dicotyledonous tree grown where there are regularly alternating seasons be examined, the successive cylinders of wood formed as described will appear as a series of rings known as 'annual' rings (STEM, fig. 1). While this is the term universally used for the annual accretions to the woody stem, it must be pointed out that they appear as rings on the cross-section only. Their true character becomes immediately apparent on an examination of a radial section. These so-called annual rings are of enormous importance in the diagnostic examination of all trees which manifest them. They are, however, commonly absent in trees grown in tropical climates. It should be noted that in many trees the spring or early wood in each ring is very much more open in character than the late or autumn wood (fig. 2). This feature is particularly well exemplified in oak, elm, &c. The bulk of cells which constitute the secondary wood belongs to the categories already described, but intermediate types are sometimes found.

In considering the primary structure of the stem reference was made to the thickening of the cell walls. A similar thickening of the walls occurs in the cells of the secondary wood, but such thickening is not uniformly deposited over the whole of the cell wall. Numerous small unthickened areas occur. These are usually found at corresponding points in adjoining cells, so that at these places only the primary cell wall (fig. 3), or middle lamella, separates the two cells. Such cells are said to be pitted.

In this connection it must be pointed out that there are two types of pits—the simple and the bordered. The *simple* pit (fig. 3, 4) is a small, oblong, circular, slit-like or elliptical passage extending from the lumen or cell cavity to the middle lamella. It is of uniform width throughout, or broadens somewhat towards the aperture. The *bordered* pit (fig. 3, 5), on the other hand, has a base which is broader than the aperture. The structure of typical bordered pits may be roughly illustrated by two watch-glasses (in the centre of each of which a hole has been drilled), which are placed in juxta-position with the rims together, but with a sheet of paper between them to represent the middle lamella, the unthickened, or at most only partially thickened, cell wall. A bordered pit in surface view (fig. 3, 5 B) appears as two concentric circles, the smaller of which represents the aperture, and the larger the base of the pit. In the bordered pits of conifers the septum shows towards its centre a slight thickening known as the torus (fig. 3, 5 A).

In vessels the pits are generally bordered, though there are circumstances in which the border is either very insignificant or absent; in tracheids they are invariably bordered; in fibres, simple or almost indistinguishably bordered; and in parenchymatous cells, always simple. The characteristic differences in the pitting of various elements are an important diagnostic factor in the recognition of the wood of various trees.

In an examination of the cross-section of any dicotyledonous tree it will be observed that the cambium not only produces vertical wood cells, but also radiating medullary rays (STEM, fig. 1) of varying width and depth, particularly as between different varieties. These increase in number with the growth in the diameter of the bole, and their cells lie horizontally in the tissues. All new rays formed during secondary thickening are known as secondary medullary rays (STEM, fig. 1). The cells of the rays of all dicotyledonous trees are parenchymatous.

Another feature of many trees is the differentiation of the inner wood from the outer. The former, which is usually darker or more highly coloured, is known as the duramen or heartwood, and the latter as alburnum or sapwood. Gradual changes occur in the wood as it becomes older, more and more layers being added to the heartwood. The change is to be correlated with the cessation of functional activity in the inner layers, which are thus converted into a dead, central, supporting column. During this conversion of the alburnum into duramen, many physical and chemical changes are effected in the wood. The cell walls become infiltrated with oils, gums, resins, &c., the cell cavities also frequently become plugged with similar deposits. The vessels, too, often become choked with cellular ingrowths from adjoining living cells. It is the deposition of these various substances in the heartwood that is responsible for the changed colour of the inner wood.

The description given above of the dicotyledonous stem applies in general also to a coniferous stem. In detail there are the following differences: (1) There are no true vessels or wood fibres in the conifers. (2) Tracheids and parenchymatous cells alone enter into the structure of the wood. (3) The medullary rays of certain genera have tracheids as well as parenchymatous cells.

A further structure, not so far mentioned, namely the resin duct, also occurs in the xylem of some plants. It is typically developed in certain conifers. On the cross-section, e.g., of a pine stem, these ducts are frequently visible to the unaided eye as narrow punctures or channels which form receptacles for the resin secreted by the surrounding cylinder of parenchymatous cells (epithelium).

In monocotyledonous stems the vascular bundles, while on the whole possessing a similar structure to those of dicotyledonous stems, nevertheless differ from them in that differentiation of the bundle tissue into wood and bast is complete. They are therefore closed bundles, and incapable of giving rise to secondary growth in thickness. As in the dicotyledons and gymnosperms, the bundles are collateral, with the xylem on the inner side. While in a few plants the bundles are arranged in a circle round a pith, it is characteristic of most monocotyledons that the bundles are irregularly distributed.

The position in the vascular cryptogams may be briefly outlined as follows: In *Selaginella spinosa*, the only British species of this genus, there is a single central cylinder or stele traversing the centre of the stem. It contains no pith, and is a solid

core of xylem surrounded by phloem, the xylem being entirely composed of tracheids. The type of stele here exemplified is known as a protostele, and is regarded as the most primitive form, from which other types have evolved. In very young ferns an essentially similar type of stele is generally found, but, with few exceptions, in older stems the structure gives way to a cylindrical network, as in the male fern, where the arrangement is somewhat suggestive of a coarse gas mantle. Each strand of this vascular network is in type a replica of the protostele, and the xylem generally consists of parenchyma and very long tracheids with horizontally-elongated (scalariform) bordered pits, genuine vessels occurring only in exceptional cases. The type of stele here found may be regarded as intermediate between the protostele of *Selaginella spinosa* and the vascular arrangement in the flowering plants.

In the vascular structure of the horsetails (*Equisetum* spp.) we find a still nearer approach to the higher plants. The stem is always traversed by a number of collateral bundles, arranged in a ring, with xylem on the inner side and phloem on the outer. Cambium is, however, absent, and no secondary growth in thickness takes place. There are in all the groups variations in the details of the vascular structures, but these deviations cannot here be pursued.

Wood, Sir Andrew (*c.* 1455–1539), Scottish sea-captain, was a knight of Largo, and was intimately associated with the endeavours of James IV. to found a Scottish navy. He is chiefly remembered for his exploits in 1489 (as related by Pitscottie). With *The Yellow Carvel* and *The Flower* he captured off Dunbar five English vessels that were raiding in the Forth, and brought them into Leith. Later in the year Henry VIII. sent Stephen Bull with three ships to avenge this, but Wood, with his same two, defeated them in the Firth of Forth and brought them into Dundee.

Wood, or À Wood, Anthony, antiquary, was born at Oxford, 17th December (St Lazarus' Day) 1632. In 1647 he was entered at Merton College as a gentleman-commoner, and became a postmaster; in 1652 he took his bachelor's, in 1655 his master's degree. Being of independent means, he took to no profession, but practised the violin assiduously, and devoted himself to heraldry and antiquarian studies. Lighting on Dugdale's *Antiquities of Warwickshire*, he recognised the work of his life, and thereafter laboured with a more constant assiduity. The fruit of these labours was his *History and Antiquities of the University of Oxford*, his copy of which the delegates of the university press bought for £100, caused it to be translated into Latin, and published as *Historia et Antiquitates Universitatis Oxoniensis* (2 vols. folio, 1674). Wood was very ill satisfied with the translators' work, and made a new copy of his English MS., which was at length published by John Gutch, as I., *The History and Antiquities of the Colleges and Halls in the University of Oxford*, with an appendix containing *Fasti Oxonienses* and Index (2 vols. 4to, 1786–90); II., *The History and Antiquities of the University of Oxford* (2 vols. in 3, 1792–96). He continued to labour on his great work, *Athenæ Oxonienses:* an exact history of all the writers and bishops who have had their education in the university of Oxford from 1500 to 1690, together with the *Fasti* or Annals for the said time (2 vols. folio, 1691–92). In 1693 he was fined in the vice-chancellor's court and banished the university for some libellous remarks therein on the Earl of Clarendon, but was permitted to return after a recantation. He died 28th November 1695.

Other works were *The Ancient and Present State of the City of Oxford* (4to, 1773, which forms a pendant to the earlier of his two great works), and the ill-natured *Modius Salium, a Collection of Pieces of Humour* (1751). Wood himself prepared the materials for a third volume of his *Athenæ*, but did not see it printed. This was included in the second edition printed by Tonson (2 vols. folio, 1721). The third edition, with additions, is that by Philip Bliss (4 vols. 4to, 1813–20); a projected fourth by the same erudite scholar, to be issued by the short-lived Oxford Ecclesiastical History Society, saw only the first volume, containing the Autobiography (1848). This last was edited in 1892 for the Oxford Historical Society by Mr Andrew Clarke, who admirably edited the *Life and Times of Wood*, in 5 vols. (1891–1900).

Wood, Sir Evelyn, soldier, was born, the son of the Rev. Sir J. P. Wood, at the vicarage of Cressing in Essex, 9th February 1838, and entered the navy in 1852, serving in the Crimea with distinction in the Naval Brigade. He then became a cavalry officer, and as brigade-major was present at several engagements in the Indian Mutiny war, receiving the thanks of the Indian government and the Victoria Cross. As lieutenant-colonel of infantry he was with Wolseley during the Ashantee war. He was called to the bar in 1874, but left the Middle Temple to command a column through the Zulu war, leading the advance as brigadier-general at Ulundi. Created K.C.B. in 1879, he had a share in the Transvaal settlement (1880–81); he received the thanks of parliament for his services in Egypt, became commander-in-chief of the Egyptian army, and at home, after commanding the eastern district and at Aldershot, was made quartermaster-general (1893), adjutant-general (1897), and field-marshal (1903). He was V.C., G.C.M.G., and G.C.B.; held the Medjidieh order, a knighthood of the Legion of Honour, &c.; and he wrote on the Crimea in 1854 and 1894, and on *Cavalry at Waterloo* (1896), as well as autobiographical and other works. He died 2d December 1919.

Wood, Mrs Henry (*née* Ellen Price), born in Worcester, 17th January 1814, daughter of a glove-manufacturer, was married early to Mr Henry Wood, a merchant in France, but settled after his death in London, and commenced writing for *The New Monthly Magazine* and *Bentley's Miscellany*. Her first novel was *Danesbury House* (1860), a prize tale of the Scottish Temperance League, followed by *East Lynne* (1861), which had an almost unexampled success, although in no sense a great story. Having found her public, Mrs Wood poured forth in succession upwards of thirty novels more, perhaps the best being *The Channings* (1862), *The Shadow of Ashlydyat* (1863), *Oswald Cray* (1864), *A Life Secret* (1867), *Dene Hollow* (1871), *Within the Maze* (1872), and *Pomeroy Abbey* (1878). In her novels she contrived to unite plot and melodrama without outraging morality, but her work never rises in quality above the commonplace, and there is ever present a thread of vulgarity. She revealed, however, some power in the analysis of character apart from plot in her anonymous *Johnny Ludlow* stories (1874, 1880). Mrs Wood in 1867 became the proprietor of the *Argosy* magazine, and her novels appeared in it long after her death, on 10th February 1887. See *Memorials* (1895) by her son.

Wood, Sir Henry, conductor, was born in 1869 at London, and studied there at the Royal Academy of Music. At the Queen's Hall he has conducted the promenade concerts since 1895, the symphony concerts and the Sunday orchestral concerts since 1897, and he has toured in the provinces and in America. Besides being a brilliant and versatile interpreter of both classical and modern (especially British) music, he is also known as an admirable conductor of choral works, and has published a book on singing. He was knighted in 1911.

Wood, JOHN GEORGE, popular writer on natural history, was born in London in 1827, and studied at Merton College, Oxford. Till 1862 he held some minor appointments (as chaplain, &c.), but is known as author of a long series of works on Zoology, comprising a smaller and a larger *Natural History* (1852; 18th ed. 1891), *My Feathered Friends*, the *Common Objects* group, *Petland*, *Insects at Home*, *Insects Abroad*, *Man and Beast*, and *The Dominion of Man over Animals* (posthumously published). He died 4th March 1889. See the Life by his son (1890).

Woodbine, a name for the Honeysuckle (q.v.), given also to other climbers, such as some kinds of ivy, the Virginian creeper, &c.

Woodbridge, a market-town and river-port of Suffolk, on the right bank of the Deben, which expands into an estuary, 12 miles from the sea and 8 ENE. of Ipswich. The *Udebryge* of Domesday, and the seat of a 12th-century Augustinian friary, it has a fine Perpendicular church with a flint-work tower 108 feet high, a Flemish-looking town-hall, and the richly endowed Seckford almshouses and grammar-school—the former dating from 1587, and rebuilt in 1840. Bernard Barton and Edward FitzGerald were residents. Vessels of 140 tons can reach the town, which exports corn, malt, and bricks. Pop. (urban district) 4600.

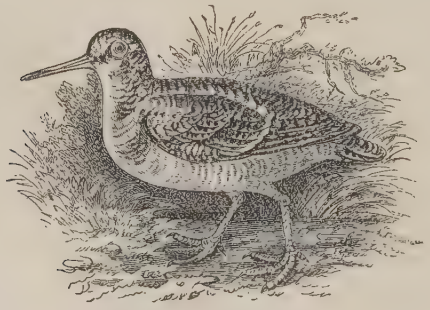
Woodburytype. See PHOTOGRAPHY.

Wood-carving. See CARVING.

Woodchat (*Lanius senator*), a bird which, notwithstanding its name, is not a species of Chat, but of Shrike (q.v.). Its whole length is about 7 inches. The upper parts are mostly black, the under parts white; but there is a white spot on the wing when closed, and other small portions of the wing-feathers are white, as well as the outer tail-feathers, and there is a narrow streak of white above each nostril; the crown of the head and nape of the neck are rich chestnut red. It is a rare non-nesting visitor to Britain, but is abundant in summer in the southern parts of Europe, where it breeds. It winters in tropical Africa. In food and habits it resembles other shrikes, only feeding more largely on insects and being fond of bathing.

Woodchuck. See MARMOT.

Woodcock (*Scolopax*), a genus of birds of the family Scolopacidæ, allied to the Snipes (q.v.), but of a more bulky body and with shorter and stronger legs. The Common Woodcock (*S. rusticula*) is comparatively abundant throughout Britain during the winter months, and a small but increasing number remain all the year round. The chief breeding-grounds of the woodcock are the great pine-forests of northern Europe and Asia, but in



Woodcock (*Scolopax rusticula*).

winter it is found as far south as the shores of the Mediterranean. The nest is formed simply by lining a sheltered hollow with dead leaves, and three or four yellowish eggs with brown markings are laid in March or early in April. The young birds are sometimes carried by the mother from place to place. There is no doubt as to the fact, but the method seems to vary. Observers describe them being carried between the mother's thighs, between the feet, against the breast with the help of the bill, or with the help of both bill and feet. The woodcock feeds chiefly on earthworms, which are sought for in the early morning and at dusk. The tip of the bill is exquisitely sensitive and slightly mobile. The adult bird is 14½ inches, and weighs less than 1 lb. The general colour of the plumage is a warm ruddy brown with black spots on the upper parts, and yellowish brown with dark bars on the under parts. The American Woodcock (*Philohela minor*) is a smaller bird than the European species, and very quaintly proportioned. Its flesh is esteemed a great delicacy, and the bird is rapidly becoming scarce. See Howard Saunders's *Manual of British Birds*, and Coward's *British Birds*.

Wood-engraving, or XYLOGRAPHY (Gr. *xylon*, 'wood,' and *graphō*, 'I write'), the art of engraving designs on wood, differs from copper and steel plate engraving by having the parts intended to print on the paper in *relief*. While *plates* are printed from the engraved lines by a laborious and necessarily slow process (see ENGRAVING), wood-engravings, having the object to

Fig. 1.

be represented on the surface, in the manner of a type, may be printed along with the matter they are intended to illustrate in the ordinary printing-machine. This, of course, is an important point in the illustration of books, on the grounds of cheapness and expedition. Another advantage wood-engravings possess is that they can be multiplied to any extent by means of the electrotype process (see ELECTRO-METALLURGY).

The invention of wood-engraving, like that of gunpowder, has been claimed for the Chinese, whose books have certainly been printed from engraved wood-blocks for ages. It has indeed been asserted that the art of cutting figures in relief, and printing impressions of them on paper, was

known and practised by that nation as early as the reign of the renowned Emperor Wu-Wang (1120 B.C.); while later, the coloured prints of the Japanese were impressed from wood-blocks (see JAPAN, *Pictorial Art*). There is no doubt that wood-stamps were used by the ancient Egyptians and Romans for stamping bricks and other articles of clay; and that wood and metal stamps of monograms, &c., were used in various European countries, for attesting deeds and other documents, at a very early period, when the ability to write was an extraordinary accomplishment even for princes. It is not, however, until the beginning of the 15th century that we find any direct evidence in Europe of the existence of wood-engraving, as we now understand it. It appears to have been used in Germany at that time for printing playing-cards and figures of saints. One of the earliest prints of which any certain information can be obtained was discovered in the convent of Buxheim, near Memmingen in Bavaria—pasted within the cover of a Latin MS.; it represents St Christopher carrying the infant Saviour across the ferry, and is dated 1423. Fig. 1 is a reduced facsimile of this curious engraving, which measures $11\frac{1}{2} \times 8\frac{1}{2}$ inches, and is tinted. It is a work of some merit, notwithstanding its apparent roughness, the infant Saviour and the drapery of the saint being drawn with considerable skill and vigour. The Latin inscription at the bottom may be thus translated: 'In whichever day thou seest the likeness of Christopher, in that same day thou wilt, forsooth, die no evil death.—1423.' Shortly afterwards a series of books, printed entirely from wood-engravings, called block-books, were issued. They consisted principally of religious subjects, with short descriptions engraved on the same block. The most important of them were the *Apocalypsis, seu Historia Sancti Johannis;* the *Historia Virginis ex Cantico Canticorum;* the *Ars Moriendi;* and the *Biblia Pauperum* (q.v.). The illustrations, of which Jackson in his treatise on the *History and Practice of Wood-engraving* gave an elaborate account and several specimens, seem to be drawn with a supreme contempt for perspective and proportion, but bear evidence of the draperies, and hands and faces, having been carefully studied. Fig. 2 is a copy of one of the engravings in the *Apocalypsis*. It represents St John preaching to three men and a woman, with the inscription: *Conversi ab idolis, per predicationem beati Johannis, Drusiana et ceteri'* (By the preaching of St John, Drusiana and others are converted from their idols). Fig. 3, from the *Biblia Pauperum*, is curious as showing the general manner of representing the creation of Eve during the 15th century, the same subject frequently occurring previous to 1500. Both have the appearance of careful drawings rather roughly engraved. Previous to the invention of movable types whole books of text were also engraved on wood, and the impressions had evidently been taken by *rubbing* on the back of the paper, instead of steady pressure, as in the printing-press, the ink used being some kind of distemper colour.

Fig. 3.

Of the books, printed from type, with wood engravings, one of the first was the *Speculum Humanæ Salvationis*, issued by Coster of Haarlem. The Psalter printed by Fust and Schöffer at Mainz in 1459 is illustrated with initial letters engraved on wood, and printed in two colours, blue and red, which have been considered to be 'the most beautiful specimens of this kind of ornament which the united efforts of the wood-engraver and the pressman have produced. They have been imitated in modern times, but not excelled.' It is worthy of note that, although printed upwards of 400 years ago, the freshness and purity of the colours remain unimpaired. It is possible, however, that some of the small book illustrations at the end of the 15th century were really engraved on metal.

As printing spread, the publication of illustrated books became general in Germany and Italy, and reached England in 1476; in which year Caxton (q.v.) published the second edition of the *Game and Playe of the Chesse*, with figures of the different pieces. They are very rude compared with the earlier German works. Fig. 4 is a reduced copy of the 'Knight,' and is interesting as one of the first wood-engravings executed in England. Several works followed, all, however, executed in the same rude manner. The first attempt at something finer than simple lines appears in the frontispiece to the Latin edition of Breydenbach's *Travels*, printed at Mainz by Erhard Reuwich, 1486. It is by an unknown artist, and is an elaborate and really very beautiful specimen of the art. It is also remarkable as being the first engraving introducing *cross-hatching* to represent dark shadows. The *Nürnberg Chronicle* (1493), with over 2000 cuts, and the *Navis Stultifera* (1497), printed at Basel, are both noteworthy. The *Hypnerotomachia Poliphili*, printed at Venice by Aldus in 1499, is worthy of mention for the extreme beauty of the designs, which have been ascribed by some authorities to Raphael, and by others to Mantegna. Much excellent ornamental work was done in France by Simon Vostre, Antoine Verard, and others. About the beginning of the 16th century a complete revolution in the art of wood-engraving was accomplished by the genius of Albert Dürer (q.v.). His pro-

Fig. 2.

ductions exhibit not only correct drawing, but a knowledge of composition and light and shade, and attention to the rules of perspective, which,

Fig. 4.

with the judicious introduction of subordinate objects, elevate them to the rank of finished pictures. His most important work in this medium includes the *Scenes from the Apocalypse*, *The Larger Passion*, *Life of the Virgin*, and *The Smaller Passion*, with fifteen, eleven, twenty, and thirty-six cuts respectively. Dürer, however, in common with most of the German artists of his day, paid very little attention to the propriety of costume in his religious subjects; one of his drawings in the *History of the Virgin* (1511), for instance, representing the birth of the Virgin, shows the interior of a German burgomaster's house of his own day, with a number of gossips drinking from flagons and otherwise enjoying themselves. There has been considerable discussion as to the probability of Dürer having also *engraved* his drawings, except the *Knight Death and the Devil*, *Melancolia*, *St Jerome in his Chamber*, and a few other famous individual works not embodied in a series. Most of the best authorities on the subject, including Bartsch, Jackson, Firmin Didot, and Cundall, agree in the negative. The best of Dürer's contemporary artists on wood were the painters Hans Burgkmair (q.v.), Lucas Cranach (q.v.), and Hans Schäufflein. The gigantic series *The Triumphs of Maximilian* was designed by Dürer and Burgkmair, and cut by some eleven engravers, while other books with woodcuts illustrating the reign of Maximilian also appeared.

During the first half of the 16th century the publication of books illustrated with wood-engravings still increased, and prevailed to a greater extent than at any other time, with the exception of the present day. The superiority of talent, both in drawing and engraving, however, still remained with the Germans, though Geoffroy Tory and other French designers produced many prayer-books, &c., with ornamental borders which were extremely beautiful. In Italy and England the art was very far behind. By far the most remarkable work published at this time was the famous *Dance of Death* (q.v.), issued in 1538, designed by Hans Holbein (q.v.) and cut by Hans Lützelburger. The original edition of this curious work contained forty-one engravings (seventeen being added afterwards), which represented the struggle between Death, generally in the form of a skeleton, and different individuals, such as the Pope, the Emperor, a Judge, Monk, Doctor, Duchess, Old Man, &c. Holbein's *Bible Cuts* are worthy of mention, while towards the conclusion of the century the art had made considerable progress in Italy and in Belgium but not so much in England, where John Daye published almost the only illustrated books of the time, notably Queen Elizabeth's Prayer-book, which contains a tolerably well executed portrait of Her Majesty. There is no certain knowledge about any of the artists or engravers, although John Daye is supposed to have engraved some of his blocks himself. At this time also the practice of printing wood-engravings in colours from different blocks became somewhat common, although the attention of artists in that line was mostly confined to ornamental subjects. From the beginning of the 17th century the decline of wood-engraving may be dated, Germany, the cradle of the art, being the first to forsake it; the only works worthy of notice were a series of blocks on various subjects—designed by Rubens, and engraved by Christopher Jegher of Antwerp, one of the best wood-engravers of that period—some of which are of great beauty. From this time the art fell into a state of great neglect, not apparently for want of engravers, for woodcuts of a certain kind were always produced, but for want of artists able or willing to make drawings worthy of preservation.

Nothing particularly deserving of notice occurred until 1766, when John Michael Papillon, an enthusiastic professor of the art in France, published an elaborate history of the subject in an unsuccessful attempt to restore it to its former importance.

Fig. 5.

But it was not until the genius of Thomas Bewick (q.v.) was brought to bear on it that wood-engraving received that impetus which has made it what it now is—one of the most important of the illustrative arts. Bewick's most important works are his *History of British Quadrupeds* (1790) and of *British Birds* (1797–1804); all the quadrupeds and almost all the birds were drawn and engraved by himself. The birds especially are executed with a truthfulness and skill which has rarely if ever been equalled. These works are also famous for their collection of tailpieces, which display an infinite amount of humour and pathos. Fig. 5 is a reduced copy of one of them—a poor ewe, in the starvation of winter, picking at an old broom in front of a ruined cot—a scene, trifling as it seems, which tells a woeful tale of suffering. He entirely abandoned the elaborate system of 'cross-hatching' which prevailed so much in the works of the older engravers, and produced his light and shade by lowering the wood in the background or by leaving solid masses of the block.

Since Bewick's time wood-engraving has continued to flourish without interruption. He left behind him several pupils, the most successful of whom were Nesbet, Clennell (who engraved some of the tailpieces in the *British Birds*), and William Harvey. Harvey, however, forsook the burin for the pencil; and his drawings illustrating Milton's *Paradise Lost*, Thomson's *Seasons*, &c., especially such as were engraved by John Thomson (perhaps the most skilful engraver that ever lived, and a

pupil of Robert Branston, a self-taught engraver), still retain a first-class place as specimens of wood-engraving. The establishment of the *Illustrated London News* (1842) tended greatly to familiarise the public with the beauties of wood-engraving. In the pages of that periodical appeared the first drawings on wood of (Sir) John Gilbert and Birket Foster. The spirited figure-subjects of the former and the exquisite landscapes of the latter did much to raise the art in England, while Orrin Smith and Samuel Williams are both worthy of mention. Later, Millais, Rossetti, Fred Walker, and others made designs which were engraved by such workers as the Dalziels, Swain, Hooper.

The closing quarter of the 19th century was an important period in the history of wood-engraving; firstly, from the rise of what was called the American school, and secondly, from the development of 'process' engraving. The first was typified in many of the finer illustrated magazines published in the United States and England. At first their tendency was to use the burin to imitate something else, such as chalk or pencil drawings, which they certainly did with great fidelity; but this could scarcely be called the proper province of wood-engraving. W. J. Linton (q.v.), the veteran wood-engraver, in several works rated them soundly for what he considered their mistaken notions, and advocated a simpler style of line, such as was used by himself with masterly skill. Though his advice was ridiculed, an undoubted change gradually took place, and as specimens of pure wood-engraving much of their later work was very near perfection. In England the art was encouraged by William Morris, and in Germany much excellent work was done by many artists and engravers. The development of the 'process' (see ILLUSTRATION OF BOOKS) was so rapid and so successful that a collapse, almost total, took place in the fortunes of wood-engraving. Its great cheapness and, when well done, the accuracy of its reproduction, have given it a place which promises to be permanent.

The first quarter of the 20th century was noteworthy, however, for a great revival of wood-engraving; it ceased to be used merely for purposes of reproduction, but came to be cultivated for its own sake. Further, the artist frequently became engraver as well, while delightful colour-effects were achieved by a serious of superimposed blocks of different tints. In England Charles Ricketts and Charles Shannon led the way, and the names of Sturge Moore, Lucien Pissarro, Gwendolen Raverat, Sydney Lee, Frank Brangwyn, and William Nicholson may be cited. In France the art became even more vital, and the number of books of all types illustrated with woodcuts is steadily growing. The great pioneer was Auguste Lepère, while others who worked in this medium were Pierre Gusman, Paul-Émile Colin, J. E. Laboureur, M. F. Siméon, Émile Bernard, and Paul Baudier.

Practice of Wood-engraving.—The wood used for engraving is boxwood, which has the closest grain of any wood hitherto discovered. It is principally imported from Turkey for the purpose, as the English box is too small to be of much use. It is cut *across* the grain in slices, which are dressed to the same height as type for convenience in printing. Inferior kinds of wood, such as American rock maple, pear-tree, plane-tree, &c., are used for coarser purposes; and for very large and coarse subjects, such as posting-bills, common deal is used, and cut on the *side* of the wood with chisels and gouges. When *blocks*—as the pieces of wood are termed—are required of a larger size than a few inches square it is necessary to join two or more pieces together, as the amount of *sound* wood to be got out of even a large slice is extremely limited. There is, however, for all practical purposes no limit to the joining process, as blocks have been printed consisting of from 50 to 100 pieces. The wood having been made very smooth on the surface, and squared to the required size, the surface may be prepared with water-colour Chinese-white, and the subject to be engraved drawn upon it in the usual way with brush and pencil; or it may be photographed on the wood from a drawing made on paper (see PHOTOGRAPHY). The latter method has many advantages, and is almost universally employed. The drawing is not destroyed in the process as if executed on the wood, but can be used to refer to, in touching up the engraving, and it may be sold separately if of value. When the block is prepared with the drawing, or photograph, it is given to the engraver, who, previous to commencing, carefully covers it with paper, fastened round the edges with beeswax; this is necessary, to avoid rubbing the drawing out in the process. As the engraving proceeds he gradually tears the paper off.

The tools or gravers necessary in wood-engraving are of many varieties, from those with fine points to cut fine lines, ranging through all sizes up to small chisels to cut out the wide white pieces. Fig. 6 represents the method of using the graver. Most engravers use a glass of slight magnifying power, more for the purpose of relieving the eyes from the strain of fixing both eyes closely on a small object than for magnifying the work. When gas or other artificial light is used a glass globe filled with water, slightly tinted with blue (to neutralise the reddish glare of the light), is placed between the flame and the work: this serves the double purpose of concentrating the light on the block and keeping it out of the eyes. When the drawing is in outline, or mostly so, the engraving is very simple; the process consists of engraving a line along each side of the pencil lines, which are, of course, to be left in relief, and afterwards cutting out the pieces between. It will thus be understood that every part of a woodcut which prints on the paper

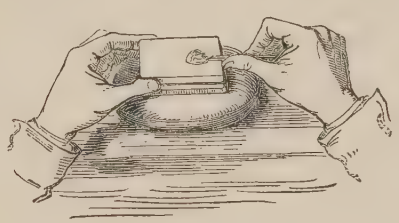


Fig. 6.

is the surface of the wood left untouched, and that every white part is cut or hollowed out. Fig. 7 represents a little subject *outlined;* fig. 8 is the same subject *finished.* When it is complicated with much shading, trees, &c., it becomes much more difficult, and brings into play the artistic talents of the engraver to preserve the proper shades, or *colour*, as it is technically termed, and texture of the different objects, the most skill being required where the drawing has been executed entirely or mostly by brush-work, and the execution is left entirely to the engraver. By a judicious use of his various tools, cutting out or leaving the lines thicker or thinner, marvellous effects may be produced by very simple means. Some of the finer portraits entirely engraved from photographs from life, which may be seen in many of the better-class magazines, are wonderful instances of this skill, and are worthy of careful study.

When the drawing is all engraved, a proof is taken by inking the surface gently with printing-

ink on a dabber (a ball of cotton covered with silk or leather), and, a piece of *India-paper* being laid on it, by rubbing the paper with an instrument

Fig. 7.

Fig. 8.

called a *burnisher* until it is all printed; or, where the block is large, printed in a small press. The engraver then sees what touching up it requires before it is finished and ready for the printer.

When large blocks are to be engraved the pieces of wood are joined with screw-bolts, and the drawing prepared in the usual manner; after which the pieces can be taken separate for convenience in engraving, and also for the purpose of getting it quicker finished by having an engraver working at each piece.

See ENGRAVING, ILLUSTRATION OF BOOKS, LITHOGRAPHY, PHOTOGRAPHY, PRINTING, &c. See also Didot, *Essai sur l'Histoire de la Gravure sur Bois* (1863); Hamerton, *Graphic Arts* (1882); W. J. Linton, *Wood-engraving in America* (1882), and *Masters of Wood-engraving* (1889); Morley Fletcher, *Wood-block Printing* (1916); Salaman, *Modern British and French Wood-cuts* (1919); books on 15th-century wood-engraving in the Netherlands by W. M. Conway (1884), and in Italy by Lippman (1888); books on Japanese wood-engraving by Tokuno (1893) and Anderson (1895); general histories by Jackson and Chatto (new ed. 1881), Woodberry (1883), Cundall (1896), Kristeller (1905), Würtenberger (1919), the last two being in German.

Wood-evil. See CONSTIPATION.

Woodfall, HENRY SAMPSON (1739–1805), was publisher of the Letters of Junius (q.v.).

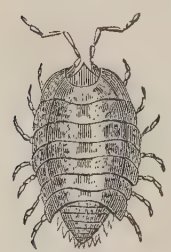
Wood-gas. See GAS (HEATING AND LIGHTING BY).

Woodhall Spa, an urban district of Lincolnshire, near Horncastle (q.v.), with bromo-iodine springs situated among pines and firs; pop. (1921) 1635.

Woodhouselee. See TYTLER.

Wood-ibis. See TANTALUS.

Wood-lice (*Oniscoida*), a sub-order of Isopod Crustaceans of terrestrial habit. The body is more or less oval in outline and flattened from above downwards. There are nineteen pairs of appendages, as in the other higher Crustaceans, including two pairs of antennæ, several pairs of jaws, seven pairs of walking legs, and plate-like abdominal limbs, the internal halves of which are traversed by minute respiratory-tubes. For the wood-lice are air-breathers. They frequent damp places, under stones and bark, and among moss, and avoid the light of day. Their food consists of parts of plants, both living and dead. The reproductive processes are intricate. Among the common forms may be mentioned *Oniscus murarius* (known in Scotland as *Slater*), *Porcellio scaber*, *Armadillidium* (able to roll itself up into a ball), *Ligia* (common in crannies among the sea-shore rocks, and indicative of the source from which the terrestrial forms have been derived). A peculiar little form, *Platyarthus hoffmannseggii*, lives in ants' nests. It is white and blind, and probably acts as a scavenger, for the ants tend it carefully. See Webb and Sillem, *British Wood-lice* (1906); Budde Lund, *Isopoda Terrestria* (1900).



Wood-louse (*Oniscus murarius*).

Wood-naphtha. See PYROXYLIC SPIRIT.

Wood-oil. See GURJUN BALSAM, TUNG-OIL.

Woodpecker (*Picidæ*), a family of birds in the order Piciariæ, remarkable for the structural modification of the skull in adaptation to its use as an axe, and for the long, flexible tongue, which is used for extracting insects from holes and crevices of trees. The family embraces at least 250 species, which are most numerous in South America and the Oriental region, less abundant in Africa and North America, and altogether absent from Australia. The members of the typical sub-family Picinæ have stiff tail-feathers; the bill moderately long, broad at the base, hard and pointed at the tip; the toes in pairs, two in front and two behind, with strong, sharp, hooked claws; the tongue capable of being protruded far beyond the bill, and furnished at the tip with horny, barbed filaments. The food consists for the most part of timber-haunting insects, and it is in the effort to discover and dislodge these that the characteristic tapping sound is made. But the woodpecker does not confine itself entirely to trees; it feeds occasionally on ground-insects, and some species are known to eat nuts and berries. The nest is simply a hole pecked out in a tree, such as the beech, of which the wood is comparatively soft, and no lining, except a few chips, is placed inside. Only three species of woodpecker occur in Britain, and none of these is very abundant except in a few localities. The best known is the Green Woodpecker (*Gecinus* or *Picus viridis*), often called the Yaffle, Woodweele, or Rainbird—the last name referring to its most frequent note, 'a loud, laughing *pleu, pleu, pleu,* popularly supposed to foretell rain.' This species is found in wooded districts in England; it is rare in Scotland, and almost unknown

The Green Woodpecker (*Gecinus* or *Picus viridis*).

in Ireland. The adult bird measures 12 inches; the prevailing colour of the plumage is green—dark olive on the upper, pale green on the under parts; the crown and back of the head are bright crimson. The Great Spotted Woodpecker (*Dendrocopus major*) and the Lesser Spotted Woodpecker (*D. minor*) are chiefly confined to the southern and

midland counties of England. The former species is about 9 inches in length, the latter only 5; in both the prevailing colours of the plumage are black and white, the male having crimson markings about the head.

Of the numerous American species the Flickers (Colaptes), the South American Ground-flickers (Soroplex), which live chiefly on termites, and the Great Ivory-billed Woodpecker (*Campephilus principalis*) may be specially noted. The last-named species, which inhabits the dense forests of the southern states, is one of the handsomest of the group, and was called by Linnæus the Prince of Woodpeckers, but as it is nowhere abundant, and is very wary, comparatively little is known of its habits. The Piculets (Picumninæ) form a distinct sub-family. They are very small, and the tail is short and not stiffened. About twenty species occur in South America and several in the Oriental region. As far as is known their habits resemble those of the woodpeckers proper. Also allied are the wrynecks (Jynx), which are restricted to the Old World.

It has been much discussed whether woodpeckers are injurious or not, but no general statement can be made, their habits varying with the species, the country, and the season. They are blamed for attacking trees, stealing seeds and fruits, and eating useful insects, such as most ants; but the trees they attack are usually not sound, and they destroy enormous numbers of injurious insects.

In Roman mythology Picus was supposed to have been turned into a woodpecker by Circe because of his love for Pomona.

Wood-pulp. See CELLULOSE, PAPER, SILK (ARTIFICIAL).

Woodruff (*Asperula*), a genus of Rubiaceæ, annuals and perennials, natives of the northern parts of the Old World, as well as India and Australia, distinguished by a funnel-shaped or bell-shaped corolla, a bifid style, capitate stigma, and dry didymous fruit. The Sweet Woodruff (*A. odorata*) is common in shady woods in Britain and all parts of Europe. It has a creeping root, a stem 5 to 10 inches long, weak and sub-erect, four or five whorls of lanceolate leaves, six to eight in the whorl, rough at the edge and keel, and small white flowers. The plant, when dried, has a very agreeable fragrance, similar to that of *Anthoxanthum odoratum* (see VERNAL GRASS) under similar circumstances. It forms an agreeable herb-tea, and enters into the composition of the popular *May-drink* of the Germans. —Dyer's Woodruff (*A. tinctoria*) is a native of the continent of Europe and of Siberia, a perennial, with reclining stems about a foot in length, whorls of six or four linear leaves, the upper leaves opposite, the flowers whitish. The root is used in Dalmatia and elsewhere instead of madder; but the crop obtained from a field is inferior in quantity to madder.

Sweet Woodruff (*Asperula odorata*).

Woods, MARGARET LOUISA, poet and novelist, was born in 1856 at Rugby, the daughter of Dean Bradley, and married Rev. H. G. Woods, president of Trinity College, Cambridge (1887–97), and Master of the Temple (1897–1915). Mrs Woods has published novels, *A Village Tragedy* (1887), *Esther Vanhomrigh* (1891), *The Invader* (1907; rev. 1922), and several volumes of poems (collected in 1913), which show both dramatic power and tragic force.

Woods and Forests. In ancient times the principal part of the royal revenues of England consisted of the rents and profits of the crown-lands, which were composed of numerous lordships and honours, with forests and chases. The demesne lands reserved to the crown at the Conquest were at one time very extensive; but while they were often added to by forfeitures, they were also so largely encroached on by grants to subjects that from the 12th to the 14th century parliament had often to interpose to compel the resumption of grants thus made. The confiscation of the property of the monasteries under Henry VIII. greatly increased the real estate of the crown; and, notwithstanding alienations by that monarch, and by Queen Elizabeth, who disposed of part of the royal domains to avoid application to parliament for supplies, the crown at the accession of James VI. owned very extensive estates all over England. The profusion, however, of James and his successors reduced the royal estates to insignificance, and no effectual restraint was imposed on their dilapidation until statute 1 Anne, chap. 1, prohibiting all alienations of the crown-lands, except by leases not exceeding thirty-one years, or three lives. From the reign of Henry VIII. to that of George III. the crown revenues were subjected to repeated changes of management; and under George III. the system was first introduced of surrendering the greater part of them to be consolidated with the rest of the public revenue, out of which the royal civil list is paid. The modern administration of the land revenues of the crown is founded on a statute of 1810, establishing a Board of not less than two or more than three Commissioners, called 'The Commissioners of His Majesty's Woods, Forests, and Land Revenues.' The law relating to the management of the crown-lands was consolidated by an act of 1810, which, repealing a number of previous enactments on the subject, placed the whole hereditaments of the crown in England, Wales, and Ireland, except advowsons and vicarages, under the management of the Commissioners of Woods and Forests, with large power of selling and leasing them; and provided that the annual land revenues should, subject to certain deductions, be carried to the Consolidated Fund during the king's life. This transfer to the Consolidated Fund, the result of a special agreement terminating with the life of the sovereign, has been renewed with his successors. In 1832 the Treasury was empowered to transfer to the Commissioners of Woods and Forests the management of the crown-lands of Scotland. In the same year parliament abolished the office of Surveyor-general of His Majesty's Public Works and Buildings, and entrusted to the commissioners the management of the public works; but in 1851 the department of Public Works was placed under separate control. See WORKS (BOARD OF). An act of 1866 introduced alterations of management. By an act of 1923, the woods and forests having been transferred to the Forestry Commissioners, the Commissioners of Woods and Forests were by an Order in Council of 1924 renamed Commissioners of Crown Lands. The Commissioners of Crown Lands act under the control of the Treasury and manage the crown lands as well as collecting ground rents.

Wood-sanicle, a glossy-leaved British woodland umbelliferous plant (*Sanicula europæa*), with

cymose umbels and hooked fruits, distributed by animals. The genus is widespread.

Wood's Halfpence, a copper coinage for Ireland granted by the English ministry in 1722 to William Wood. He was to share the profit from the difference between the nominal and the intrinsic or bullion value of the coins with the king's mistress, the Duchess of Kendal, who had secured the patent for Wood. Against the whole transaction the *Drapier's Letters* of Swift (q.v.) raised such public indignation that the patent was cancelled, and Wood compensated by a pension.

Wood-sorrel. See OXALIDEÆ.

Wood-spirit. See PYROXYLIC SPIRIT.

Woodstock, a market-town of Oxfordshire, on the Glyme, 8 miles NNW. of Oxford. It was a royal manor from Saxon times until 1705, when it was granted to the Duke of Marlborough, whose seat, Blenheim Park (q.v.), is close by. Hence it has many memories, as the birthplace of the Black Prince (though not of Chaucer), as the scene of Becket's first quarrel with Henry (if not of Fair Rosamond's murder), as the place of captivity where Elizabeth wished herself a milkmaid, and for the pranks of its 'merry devil' on the parliamentary commissioners in the old manor house, which was pulled down in 1723. A municipal borough, chartered first by Henry VI., and last in 1886, Woodstock till 1832 returned two members to parliament, and then till 1885 one. It still carries on leather glove-making. Pop. 1500. See E. Marshall's *Early History of Woodstock Manor* (1873–74), and the *Victoria History of Oxfordshire.*

Woodstock, a port of entry and capital of Oxford county, Ontario, on the Thames, 88 miles by rail SW. of Toronto; pop. 10,000.

Wood-swallow, an Australian name for any of the fly-catching Artamidæ, also called Swallow-shrike.

Woodville. See RIVERS.

Wookey Hole, a cave near Wells in Somerset, situated in dolomitic conglomerate. When discovered it was filled to the roof with débris, in which were found bones smashed and splintered and scored with tooth-marks of the hyæna, whose remains largely preponderated. The cave appears to have been a hyæna's den. Amongst other species represented were horse, rhinoceros, deer, bear, ox, mammoth, lion, fox, wolf, and lemming. Man's presence was shown by the occurrence of Palæolithic flint-implements. In the Iron Age its inhabitants, apparently cannibals, shared the culture of the Glastonbury lake-villages. Roman coins are also found. See Balch, *Wookey Hole* (1914).

Wool, the soft, hairy covering of sheep and some other animals (as goats and alpacas), has from the earliest historic times been used in the construction of yarns or threads, which by the process of weaving—interlacing two series of yarns crossing each other at right angles—have been converted into textiles possessing clothing properties. With the progress of civilisation and the development of the arts and crafts, wool became the staple material of many of the costly and elaborately-ornamented textures produced conjointly by the weaver and the embroiderer for embellishing the temples of the gods and the palaces of royalty. The collections of Egyptian and Persian fabrics in the Musée de Commerce at Lyons and in the British Museum, dating back to the 4th century of the Christian era, contain various woven specimens of decorative and other textiles, in which wool is the principal fibre, and whose individual threads are spun to such a degree of fineness or extenuation as to bespeak considerable skill in the manipulation of this material. According to Herodotus the tunics of the Babylonians were composed of woollen yarns; Homer refers to Thrace as 'the mother of flocks;' and Plato mentions the working of wool by the crossing of threads, thereby producing a tissue. As to the Romans there are many facts extant which indicate that they understood the whole art of wool manufacture as manually performed. In the ruins of Pompeii there is a complete plant of scouring, fulling, and pressing apparatus, and though it is of an extremely primitive character, still it shows that centuries ago these sections of cloth manufacture formed a specific art, and also that the felting property of wool, which distinguishes it from all other fibres, whether of an animal or of a vegetable character, was then taken advantage of in the construction of 'wool' as distinct from linen and cotton fabrics. During the period that Britain was a colony of Rome a woollen factory was established at Winchester. Although it is highly probable that the ancient Britons before the invasion of the Romans were familiar in a rude fashion with the handicrafts of spinning and weaving (it is recorded that Boadicea wore a tunic checked with a variety of colours, presumably of British manufacture), yet this Roman factory must have been instrumental in placing the weaver's art on a more efficient basis than hitherto.

Not only were the ancients acquainted with the scheme of manufacturing fabrics by weaving threads together composed of wool, but they also made, by pounding the fleece of filaments in a damp condition, a species of *felt.* Pliny accredits the Gauls with carrying on this kind of wool manufacture, stating that they produced a cloth without spinning or weaving. This must have been obtained by submitting the wool to similar chemical and mechanical conditions as are attained in the manufacture of *felts* for hats, carpets, and shoes in modern times; for the felting or fulling of wool (see below) can only be acquired by adopting a certain routine as to moisture, pressure, and temperature. It seems probable that succeeding the use of the skin of the sheep as a covering or wrap would be this type of cloth, for it is far more easily produced than the more complex texture yielded by the loom. In its construction only one process, and that an extremely simple one to perform, is necessary, whereas to make a woven fabric the wool has to be carded, spun, prepared for weaving by warping, beaming, healding, and sleying, and, lastly, formed into a texture by interlacing shoot after shoot of weft with a limited number of threads of warp. But it may be supposed that the readiness with which wool can be made to assume a weavable thread would at an early period in the history of woven manufacture suggest it to the ingenious craftsman as suitable material for textile purposes.

In the middle ages, when Flanders was the great headquarters of manufactures in wool, English wools were held in great esteem, and, in spite of frequent laws, especially from the time of Edward III., to prevent exportation, were largely purchased by the textile producers of that country. The wool-workers and weavers of Ghent and Bruges asserted themselves in war and politics against Burgundy and France. At various dates Flemish wool-workers settled in England, and taught the English, as they also taught the French, the art they had carried to so great perfection. The remarkable enactment of Charles II., that every Englishman should be buried in a woollen shroud, which was in force from 1678 till 1815, contributed in a measure to the growth of woollen manufacturing as a great national industry. Wool-working in factories and on a commercial scale was not established in the United States till about the end of the 18th century.

The accelerated development of the textile

industries, following the invention of machinery, resulted in a large increase in the growth of wool and in sheep-breeding for this purpose. Up to 1850 the wools used in the United Kingdom, in addition to those yielded by native varieties of sheep, were mainly imported from the continent of Europe, particularly Spain and Germany. Now the bulk of the world's supplies is derived from Australia, New Zealand, Tasmania, South Africa, India, and South America. These are supplemented by limited quantities obtained from Great Britain and Ireland, France, Germany, Russia, and Spain. British and Irish wools have a number of applications. Southdown and Welsh fleeces, possessing a fine fibre, and, as compared with the merinos of Australia, a lower degree of felting property, are highly suitable for flannels, and are therefore extensively purchased by the makers of these goods. Lincoln and Leicester wools, on account of their lustrous qualities, are employed in the dress, mantle, and plush trades; and the strong, useful wools grown by animals pasturing on the Cheviot Hills, the Yorkshire Wolds, and in Roscommon are utilised in the fabrication of 'tweeds.' The British and Irish wool industry is capable, by technical and agricultural training, of being considerably improved. It covers fine, medium, and long staple varieties, adapted, according to classification, to either woollen or worsted yarn production.

In mechanical structure the wool fibre is cylindrical in shape, being composed of an infinite number of minute cells. The central part or core of the fibre is ensheathed (*a*, fig. 1) with numerous

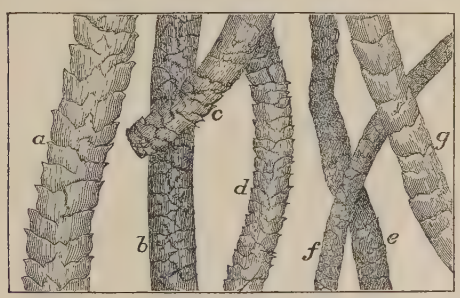


Fig. 1.

a, typical wool fibre; *b*, mohair; *c*, 'kempy' fibre; *d*, merino wool; *e*, shoddy; *f*, cashmere; *g*, Lincoln wool.

scales or thin plates more or less funnel-like in shape, and one overlapping the other. Wool is frequently defined as a species of hair, but it differs from this filament in possessing a more fully-developed serrated circumference, and an increased degree of flexibility, waviness, and elasticity. Even these features of dissimilarity are obvious when wool and mohair (the product of the Angora goat) are compared. Fibres *a* and *b* in fig. 1 show the difference in external structure. In *a*, which is a typical wool fibre, the scales are clearly defined, appear in some cases to encircle the filament, and fit one into the other; but in *b* these serrations are less prominent, and the fibre is straighter, and therefore comparatively deficient in waviness. Cashmere, a fine, downy material yielded by the Tibetan goat (*f*, fig. 1), also lacks that well-defined structure which characterises true wool. Microscopically they possess a similar but not an identical formation, and in the actual work of manufacture the difference between these several fibres is emphasised at every stage of procedure, resulting in the construction of fabrics of distinct qualities, and each used for a specific purpose.

On examining the wool fibre more minutely it is found to consist of three principal parts: (1) the outer scales; (2) the inner bark or cortical substance; and (3) the medullary or central portion. The external scales may be defined as flattened horny cells. They form the sheath or bark of the fibre. Their dimensions, uniformity, soundness, and compactness determine the lustre, firmness, and strength of the wool. The felting or fulling power is also primarily due to their presence in the fibre, being high or low in proportion to their multiplicity and strength. These marginal scales are the most numerous in fine wools, and, as indicated in relation to wool, mohair, and cashmere, differ so largely in formation and arrangement in different types of wools to make it feasible in some instances to distinguish the variety of fibre examined by its serrated surface. The interior of the filament is composed of spindle-shaped cells. Upon the density of these cells—which form the largest proportion of the fibre—the elasticity and trueness of the wool depend. Moreover this part of the fibre is said to possess greater affinity for colouring agents than the external scales, a fact which is proved by the readiness with which 'extract' wools—materials which have been recovered from woven fabrics composed of cotton and wool, by steeping the textures in a bath of diluted sulphuric acid, which destroys the vegetable fibre and leaves the animal fibre intact—can be dyed, and such extracted wools have these interior cells exposed to a considerable degree. The third or medullary part of the wool filament consists of several layers of oval cells which form the pith or core of the fibre. Occasionally these run the entire length of the hair, but they may only occur at intervals. Their functions in the structure of the fibre have not been fully determined.

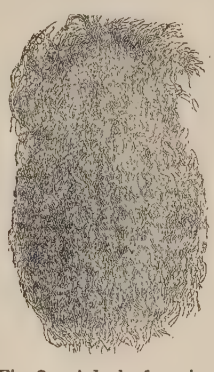


Fig. 2.—A lock of merino lamb's wool, showing the wavy character of the fibre.

When selecting wool for manufacturing purposes regard is paid to its strength, length, soundness, and elasticity of staple, fineness of hair, and lustrous and felting properties. By 'staple' is meant a lock or strand of fibres (fig. 2). Its several qualities are determined by the touch. An indication of soundness is equality of growth in the several filaments of which the staple is composed. Fibres with the greatest diameter will necessarily sustain the most tension, but the tenacity of a sample of wool is not judged by the thickness of individual hairs, but by the strength of the lock. If the fibres are considered separately, Lincoln wool, in point of strength, is superior to Australian merino, as its breaking strain, according to Bowman, is 502 grains, while the Australian is 50 grains; but it is possible to acquire from the latter wool a cloth capable of sustaining greater strain and friction than can be obtained from the Lincoln. This is partially due to the fact that the merino is ranker in growth, the staple being more compact, and also to the superior felting power of this wool, a quality which imparts increased wearing strength to woollen fabrics.

Elasticity of staple is the power the wool possesses to assume its normal condition immediately on pressure being removed. A quantity of cotton when unpacked lies comparatively solid, but on unpacking a bale of wool it rebounds and expands. This elastic or flexible property is present in the largest measure in wools of a crimpled, wavy form

(fig. 2); and, generally speaking, the finer the wool the more fully does this curliness of fibre obtain. Merino wools, for example, contain a large number of curves in a given length of hair, and are remarkable for elasticity and density of staple. Fullness and 'kindness' to the feel, and warmth and comfort in the wear are some of the qualities which the finished cloth derives from this primary property of a good clothing wool.

Lustre of fibre is essential in making certain classes of worsted yarns, and dress and mantle fabrics. Lincoln and Leicester wools are celebrated for their lustrous or shiny appearance. They are only excelled in this particular by mohair and alpaca. Straightness of fibre in combination with an outer sheath of serrations, characterised by a high degree of levelness and regularity in the size of the individual scales, gives to these materials their lustrous quality. Fineness of hair is most important in making yarns small in diameter. A thick-fibred wool is not spinnable to a great length, and cannot, therefore, be used in the manufacture of superfine cloths. It may be employed in medium-class fabrics, but it does not possess the requisite smallness of filament to be spun into high counts of yarns, which are an essential in the production of textures fine in structure or containing a large number of threads to the inch.

Wool Substitutes.—The principal substitutes for wool are noils, mungo, shoddy, extract, and flocks. Formerly mungo, shoddy, and extract were regarded purely as waste and unusable products. Now they are the chief materials employed to cheapen textiles. *Noils* are the curly neppy filaments eliminated in preparing wool for worsted yarns by combing. They are pure wool, and are a valuable material. *Mungo* is a product obtained by grinding up tailors' clippings and cast-off garments from which all cotton threads have been extracted. The primary difference between *mungo* and *shoddy* (*e*, fig. 1) consists in the latter being the result of treating soft rags, such as blankets, stockings, and comforters. Both are important materials, and are extensively used by the manufacturers of Dewsbury, Batley, Guiseley, and Yeadon. *Flocks* are the fibre removed from the pieces during scouring and milling. A few decades ago they were in large demand, but owing to the introduction of other and cheaper substitutes, changes in fashion, and the decline in the quality of all-wool fabrics they do not now occupy the same prominent place in the materials at the command of the woollen manufacturer as formerly.

Woollen Cloth Manufacture.—When the wool arrives at the factory it is in the fleece or unsorted condition, and is a promiscuous blend of all kinds of fibres, such as fine and coarse, strong and tender. A single fleece may contain as many as thirteen or fourteen sorts, but in practice it is not generally necessary to make more than five or seven qualities. The choicest wools are derived from the sides and shoulders of the animal, and the inferior classes from the head, the throat, and the shins. A good wool, though not so fine in the fibre and soft to the touch as that grown on the sides, is found on the lower part of the back. Intermediate qualities are obtained from the rest of the back and the loins. The wool on the belly is short, dirty, indifferent in quality, and frequently tender, while that coming off the lower parts of the legs is usually burry and possesses a thick fibre and a staple deficient in waviness and elasticity.

The sorter commences the operation of sorting by ascertaining if the fleece in hand is that of a *hog* or *hogget*, or that of a *wether*. The former is *lamb's* or *yearling's*, and the latter *fleece* wool. They are readily distinguished from each other by the character of the tips or ends of the fibres, those of the hog being pointed on account of the animal not having been previously shorn, whilst those of fleece-wool increase in bluntness each succeeding year. Analysis of the fleece is commenced by spreading it over a table with a wire-cage surface. During sorting a portion of the dust and other hard particles of matter, liberated from the wool, fall through this cage into a drawer beneath. An indefinite line is formed down the middle of the fleece which the sorter follows in dividing it. His work is of a twofold character. First, he removes a portion of the foreign substances which the fleece contains, and also clips away the hard, clotted tufts of fibres which in the process of growth have become fast adhered together. Secondly, he proceeds carefully to analyse the fleece, classifying the locks according to quality, and casting them into different skeps with which he is provided. The wool is principally judged by its softness of handle and its density of growth. Tenderness of staple, unkindness of feel, and want of filament density are all indications of an inferior wool.

In its natural state wool is impregnated with a greasy compound designated yolk or suint. The object of the succeeding process of manufacture—scouring—is to remove this substance without injuring the staple of the wool. When this work is properly done the material is not only clean and a perfect white, but appears elastic and open. The principal requisites here are a pure, soft water, a mild alkali, uniform temperature of the 'scour,' and as small a degree of mechanical agitation of the wool in washing as is compatible with the thorough cleansing of the fibres. Scouring is effected in machines specially designed for this purpose. They consist of two or more tanks containing the 'scour' or alkaline lye, in which the wool is immersed and gently made to travel from the receiving to the delivery end of the separate tanks, when it passes between a pair of squeezing-rollers, and from thence is conveyed to the drying-chamber. A partially scoured wool does not dye a clean colour, and yields an imperfect yarn and an unsatisfactory cloth.

If the material is intended to be *wool-dyed* it is now transferred to the dye-house, but in some instances dyeing takes place in the yarn state, and in others in the woven piece. When preparing wool for *mixture* fabrics the material is dyed before spinning; in some styles of medium and high-class fancies, in which twisted yarns are combined, *hank-dyeing* may be followed; while in the simple makes of cloths, or textures of one shade, it is more economical to dye in the piece. Whichever system of dyeing is practised, the wool, after scouring, is teazed or *willeyed*. This is a mechanical operation, and is performed with the object of opening and disentangling the felted meshes of the wool. Really this is a preliminary scribbling or carding. The *teazer* or *willey* consists of a large skeleton cylinder mounted with ten arms, each studded with two rows of teeth tapering from the base to the point, and of three smaller rollers termed 'workers' fixed over this cylinder, and also studded with metal teeth which intersect and work between those of the main cylinder when the machine is in motion. The attendant regularly distributes the material on the feed-sheet or endless apron which conveys it to the interior of the machine, where it is engaged by the teeth of the large cylinder making from 400 to 500 revolutions per minute. It travels in the opposite direction to the 'workers,' which only make from 30 to 40 revolutions per minute. Consequently, it has no sooner become charged with wool than the fibres are forced forward to be engaged and 'worked' or opened by the small rollers. This process is continued until the fila-

ments have become sufficiently separated to be in a suitable condition for *oiling*.

One effect of removing the fatty matter from the wool is to deprive it of its natural lubricant, and to make it too diffusive and dry to be treated economically without oiling in the subsequent operations of scribbling, carding, and spinning. Oil renders the fibres soft and flexible and preserves their serrated structure and natural length when operated upon by the millions of wire teeth in the carding machines. If a quantity of unoiled material were submitted to the scribbling process two unsatisfactory consequences would ensue. First, the wool would be imperfectly scribbled by being deficient in the lubricants which facilitate the separation and readjustment of the filaments effected by the scribbler. Secondly, the amount of waste material in the form of 'flyings' and 'droppings'—loose fibres given off by the various cylinders of the scribbling-engine—would be perceptibly augmented. Wool is, therefore, oiled at this stage to soften and smooth the staple, to impart adhesiveness, and thus at once minimise the loss of valuable material which would otherwise occur in this severe operation. Various compositions are used as lubricants, but the principal are olive or Gallipoli oil and oleine.

The oil may be applied manually by spreading the wool in layers on the floor and adding a sprinkling of oil to each layer, or automatically as it passes on to the *fearnought*. This machine is also termed

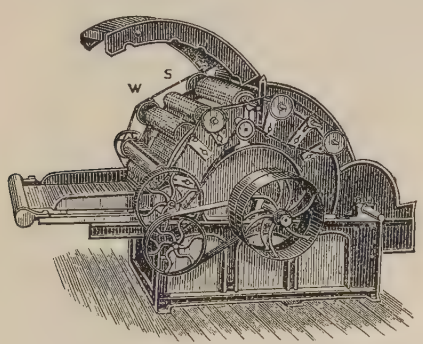


Fig. 3.

the tenter-hook willey, a name which has been applied to it on account of the peculiar form of teeth inserted in its main cylinder. A representation of this machine is given in fig. 3. Essentially it is a minute scribbler possessing three pairs of small rollers, W and S, called workers and strippers, arranged as in scribbling machines. These rollers glean the wool from the teeth of the swift, and 'work' or intermix and open the fibres between them, ultimately yielding them up to the large cylinder again, which conveys them to the next pair of small rollers, where the process of opening and mixing is repeated. This procedure is also continued by the third set of rollers, when the wool is once more recovered by the swift and passed on to the fan, which facilitates its removal from the machine.

At this juncture the material is prepared for scribbling or carding proper. This process is distinctly a continuation of the treatment to which the fibres have been subjected on the *teazer* and *fearnought*, only the machinery used is more searching in its results, and literally separates fibre from fibre. While disentangling the locks of wool and disintegrating felted meshes of filaments which have escaped the action of the rollers of the previous machines or only been partially operated upon by them, it at the same time reblends the fibres by recrossing them at every conceivable angle, uniting in the process long and short, coarse and fine, curly and straight, and producing by their amalgamation a continuous sheet or texture of filaments of uniform delicacy and density throughout its entire length and breadth.

The scribbling machine (fig. 4) is a combination of cylinders of various diameters, and revolving in different directions and at varying speeds. Each roller is covered with *card-clothing*, or with fine, pliable wire teeth. A sample of *clothing* is shown in CW, fig. 4. Obviously, as the wool is transferred from cylinder to cylinder it will be repeatedly opened and reblended, and by degrees made to assume a light, flossy, and workable condition, or one which may be readily transformed into a weavable thread. The amount of dislocation and blending the fibres are subject to in their passage through an ordinary scribbler is almost incredible. It may be understood by considering the numerous points which are constantly operating on the wool. A machine similar to that represented in fig. 4 contains no fewer than 56,000,000 teeth. These have various functions: 50,000,000 engage the material and convey it from stage to stage, resisting in so doing the action of the teeth of adjacent cylinders which may have become charged with fibres. The remaining 6,000,000 are designated 'extractors' and 'springers,' and lash or draw the wool from between the card-wires of other rollers. In a scribbler mounted in this manner the material is continually subjected to the dividing and remixing action of 25,000 points. This is not all. A set of carding-machines contains two or three engines, whose rollers all possess card-clothing of increasing fineness, so that by the time the wool escapes from this process a complete disturbance of the natural order of the fibres has been effected, and they have, moreover, been reamalgamated with such mechanical precision as to be readily convertible into a spun yarn.

The passage of the material through the scribbler may be described thus. It is primarily spread by an automatic appliance on the feed-sheet (A, fig. 4). Before being transferred on to the breast cylinder it undergoes a certain amount of opening and blending, which tends to keep up a level supply of fibres. This is accomplished by five small rollers, three of which are called 'feeds,' one the 'licker-in,' and the fifth the 'angle stripper.' The three 'feeds' are fixed one above the other, directly behind them is placed the licker-in, and over it the angle stripper. The wool is no sooner carried by the feed-sheet on to the lowest feed-roller than the licker-in removes a portion of it, which it commences, in conjunction with the centre 'feed,' to open and intermingle. It is at this point the third or uppermost feed-roller comes into action, and that the angle stripper takes charge of the material and conveys it to the breast cylinder. Here the real work of scribbling is initiated. The card-wire of the cylinder carries the wool forward until it is engaged by the first pair of small rollers (S^1 and W^1, fig. 4). The worker, though placed behind the stripper, gleans the fibres of the cylinder, while the stripper removes or *strips* it from the worker, and in turn yields it up to the rapidly revolving cylinder. It is not the design of the scribbler to accomplish at one process a perfect separation and blending of the filaments, for in so doing it would be liable to break the staple of the wool; hence the several small cylinders employed in the separation and readmixture of the fibres. The first pair of rollers are only intended to operate upon the largest entanglements, being set the farthest away from the cylinder, and also the coarsest in card-wire. The material which escapes their points is dealt with by the second set of

rollers (S^2 and W^2, fig. 4), while the smaller tufts of fibres still are engaged by the third set of workers and strippers, and so on throughout the operation. By this repeated transfer from one cylinder to another a continuous opening and mingling of the filaments is carried on from the time they enter the machine, at the feed-sheet, till they leave the same at the doffer.

Condensing follows scribbling and carding. There has been no attempt made thus far to impart to the wool a thread-like character. It is removed from the last cylinder of the carder by the condenser, whose function it is to divide the sheet of filament into narrow bands, which pass between a pair of friction leathers. These have an action similar to that of the palms of the hands when rubbed together, and give to the several strips or 'slivers' a round form—indeed, convert them into thick, soft, fluffy yarns, incapable of sustaining any degree of 'drafting' or attenuation because absolutely free from twist or twine.

Such 'slivers' or condensed threads form the germ of the spun yarn. Spinning (q.v.) is the final process in thread-making. The 'condensed slivers' pass, in the spinning-frame, between a pair of fluted rollers, and from thence to the spindles, which are fixed in a movable carriage. Primarily the rollers give out a length of 'slivers'—the carriage and the spindles receding and the latter imparting twist—and next, the rollers cease to revolve and the spindles increase in velocity, the carriage meanwhile travelling to the end of its traverse. During the latter part of its movement the thread is elongated and reduced in size, and the final degree of twist is inserted. On the return of the carriage the spindles wind up the spun yarn in 'cop' form.

As weaving is treated of in a special article, the

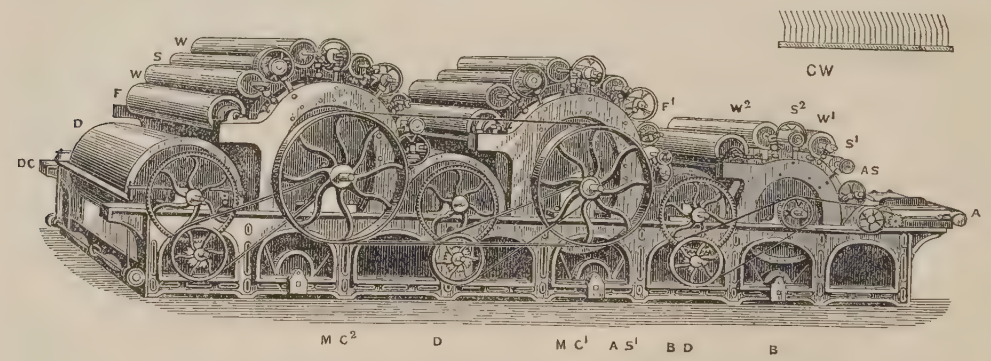


Fig. 4.—Scribbler.

A, feed-sheet; AS, breast angle stripper; W, workers; S, strippers; F, fancy; AS^1, first angle stripper; B, breast cylinder; BD, breast doffer; MC, main cylinder; D, doffer; DC, doffing comb; CW, card-clothing.

cloth has now to be followed after it leaves the loom, in which condition it is spoken of as being in the 'balk' or raw state. The characteristics of this state are threadiness of surface, looseness of structure, hardness of handle, and lack of smartness of pattern or beauty of design. To make the pieces saleable they are submitted to a lengthy series of processes, including perching, knotting, scouring, hydro-extracting, tentering, mending, milling, washing-off, 'gig' or 'curd' raising, boiling, cutting or cropping, pressing, brushing, and steaming. Of course, every description of woollen texture is not submitted to the full series of operations, such fabrics as tweeds and flannels only requiring simple and brief treatment in finishing; but in dressing a doeskin the whole routine has to be gone through.

Perching consists in making a close inspection of the piece with the object of marking all defects. *Knotting* is another manual process. As the smallest knot left in the piece may result in the fabric being torn or cut in the cropping operation, all such protrusions are carefully extracted by examining the under side first, so that the knots may be pulled out; and subsequently the face is treated, when the cloth is ready for *scouring*. The primary object here is to cleanse the piece, and the second to soften the threads and cause them to fill up the interstices existing between them when the cloth leaves the loom. If it were a mere question of scouring, it could be readily attained by using strong detergents; but these would not only injure the handle of the fabric, but also affect its brightness of colouring. Scouring-machines are of two classes—viz. those in which the pieces are twisted into a rope form during the operation, and 'open scourers,' in which the pieces are maintained in an expanded state. The latter are recommended when washing fabrics liable to crease and composed of fine yarns, but ordinary woollen goods are still largely scoured on the older system of having the pieces running through the machine in folds. To discharge the superfluous moisture the textures contain after scouring, they are taken either to the wringer or, preferably, to the hydro-extractor (see DRYING-MACHINES). The latter expels the liquid by centrifugal force, and, while imparting a 'lofty' and kind feel to the cloth, does not in any way crease its surface as the wringer is apt to do. Defects not detected before the piece is washed are visible afterwards. These are repaired by the mender, who introduces threads or 'picks' where they are missing. Fine goods are difficult to treat in this respect.

The piece is next taken to the milling-machine (fig. 5). Here it is saturated with a solution of soap and then placed in the tank, A, and threaded through one of the divisions in the guide and knocking-off motion, B. Subsequently it runs over a roller, D, and into the neck or throat, E, and thence between two rollers, C and F. The lower one is flanged, the upper one fitting between its side projections. Pressure is brought to bear on F by the springs, G, and in some cases by weights. As the piece passes between these rollers it is crushed and felted in the direction of the weft or transversely. Running now into an elongated box or the spout of the machine, it is cuttled up lengthways and therefore felted in the direction of the warp. Before the invention of the fulling-mill woollen goods were felted solely by stocks. These are still used, but for ordinary pur-

poses have been supplanted by milling-machines. In the stocks the piece, after soaping, is placed in a trough and pounded by huge hammers or fallers. Goods thus felted possess in some instances a more substantial feel than when treated in the mill. Stock-fulling is a slow process, but is more natural than felting by the milling-machine, and is preferable where great fullness of texture is required.

Before milling, the individual threads in the cloth are quite distinct, and by the aid of an analysing-glass the scheme of crossing warp and weft may be traced; single threads can be removed without difficulty. But after milling, all traces of the threads as distinct factors have disappeared. Magnifying a sample scarcely makes them visible, for it is only by singeing the surface of a hard-felted woollen, and scraping away the floss and fibre, that the texture proper can be exposed and examined. Then it becomes apparent what changes have been wrought in its condition during felting; a porous fabric has been changed into one remarkable for its density, solidity, and firmness. Wool and hair are the two kinds of fibre that will felt by this practice, and the former is infinitely superior to the latter in this respect. Its physical formation, combined with the arrangement of the fibres in a 'carded' or woollen yarn, is at the basis of what takes

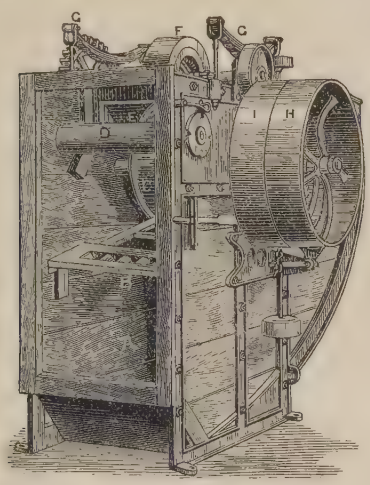


Fig. 5.—Felting, Fulling, or Milling Machine:
A, tank; B, guide frame and knocking-off motion; C, flanged roller; D, guide roller; E, neck; F, top roller; G, G, springs; H, loose pulley; I, driving pulley.

place in the fulling mill or stocks when the fibres of individual threads mat, interlock, and dovetail into each other. The soapy condition of the piece, assisted by the heat generated in felting, augments this process. Saturated as the cloth is by the soapy compound, its filaments expand. The scaly circumference of one series of fibres is forced into that of an adjoining series, and thus by the pounding or pressure, to which the piece is in the meantime subjected, the yarns are brought closer together, until the threads literally form one mass of felted wool and lose their individuality. Such excessive milling is only applied to army cloths, doeskins, pilots, beavers, and heavy fabrics. After felting, the piece is washed off, hydro-extracted, dried, and then tentered or stretched on the tenter frame.

The processes of 'finishing' proper—viz. raising, cutting, brushing, and pressing—level and smooth the cloth, improve its appearance, develop the elements of the pattern, and add lustre and beauty of texture. *Raising* is performed on the 'gig' or the Moser machine—the former consisting of a cylinder mounted with teazles, and the latter of a main cylinder and complementary small rollers, covered with wire teeth 'clothing.' Goods are raised in a *dry* condition when a clear smart face is required, as in tweeds, 'Saxonies,' and worsted coatings and trouserings. By 'getting up' the fibres and combing them out on the face of the texture it prepares the cloth for an effective and clear 'cut.' The *wet* process is adopted in finishing doeskins, moscows, meltons, and other heavy textures. It is the reverse in its effects to dry raising, aiming at preserving the fibre obtained in milling. Though it 'gets up' the filaments, it spreads or lays them on the texture, so that they give to the piece, after cutting, boiling, and pressing, a bright appearance.

Cropping or *cutting* is done on the 'perpetual,' a machine which, in principle, is identical with the lawn-mower. The surface of the cloth is evened and smartened in this process, the pile of fibres being levelled, and, if a 'fancy' texture, the style of the pattern is more prominently developed. After passing several times through the 'perpetual,' the piece is cuttled up in cardboard papers and placed in the press, heated by hot plates. It remains here till perfectly cool, when it is recuttled to take out the marks formed by folding, and again pressed. Solidity and lustre are acquired in this way, accompanied by a certain degree of harshness or unkindness of touch in the texture, which, however, may be readily removed by steaming, when the cloth is ready for the merchant.

Worsted Manufacture.—There is a difference in the appearance and characteristics of worsted and woollen fabrics, but this does not necessarily arise from the employment of dissimilar materials. It is quite feasible to employ the same class of wool in both manufactures; yet in the *worsted* the texture will be clear and bright, possessing a smartly-defined pattern, but in the *woollen* it will be covered with fibre, have a comparatively rough appearance, and its plan of construction be partially if not wholly concealed. 'Woollen' and 'worsted' as applied to these all-wool fabrics are somewhat ambiguous terms, as they signify neither the material used nor their structural differentiations. Before the combing-machine was invented only long-stapled wools were made into worsted yarns; hence it became customary to define a woollen thread as the product of spinning short wool, and the worsted as the result of combing and spinning long wool. But now that all wools of whatever length are combable this definition is quite untenable. Next the worsted was designated a combed thread, to discriminate it from the woollen, which is a carded thread. These are more satisfactory distinctions, but are inapplicable to an important class of worsted yarns. For the worsted coating, trousering, and dress trades the wools employed are invariably prepared for spinning by gilling, combing, and drawing: but for the carpet branch of the weaving industry a worsted yarn is made in which the wool is not combed. The

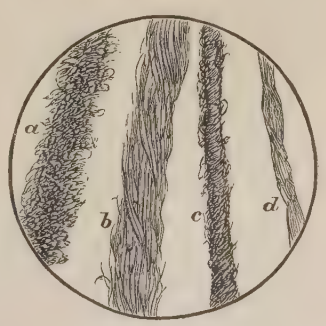


Fig. 6.
a, 30 skeins woollen yarn; *b*, twofold 30's worsted; *c*, 40's cotton; *d*, twofold 60's silk.

essential difference lies in one important element of procedure in working or preparing the wool for the final operation of spinning. When making a woollen thread the main object to be attained from the initial to the terminating stage of construction is to open, cross, and blend all descriptions of fibres in all possible ways—a routine which yields a yarn which has a rough fibrous surface (see fig. 6), and which when converted into a woven texture imparts a mellow and somewhat subdued effect to design and colour. On the other hand, in producing a worsted thread, the primary design is to place the fibres in parallel relationship with each other by in some cases extracting all curly filaments, and in all instances by as far as possible straightening and levelling them, so that a thread results which possesses a regular and well-defined circumference, and one which lends lustre to the fabric and precise development to almost every type of woven pattern.

Fig. 6 illustrates the main features of dissimilarity between woollen and worsted yarns. Here *a* is the woollen or purely carded thread. At once it will be observed how variously intermingled its fibres are. Under the microscope the core of this yarn is apparently a solid mass of filaments, twisting round which is a multitude of curly, wavy fibres of a diversity of lengths and diameters, that cross and intertwine with each other in literally every possible manner. In *b*, which is an enlarged drawing of a worsted thread, an altogether different system of fibre grouping in a yarn-like condition is evident. Now the filaments are perceptibly laid in the same plane, and form a compact and even thread.

There are three principal English systems of producing worsted yarns. First, when long wools are used, the material is gilled, combed, drawn, and spun. In the second system carding is added and precedes gilling; while in the third or carpet-yarn system the wool is carded, drawn, and spun. The special operations are those of gilling, combing, drawing, and spinning. Carding, though not precisely the same as in woollen yarn production, is similar in principle, and has been treated of above. Starting therefore with the material as it leaves the carder, previous to which it has been scoured and 'willeyed,' it is not condensed as in preparing for woollen-spinning, but is taken in 'laps' or bands, a few inches in width, and wrapped up into balls, to the backwashing-machine, where it passes through a trough containing 'scour,' and from thence over a number of drying-cylinders to the 'gill-box' part of the machine. Here it is engaged by a number of vertical pins fixed in iron bars, or 'fallers,' which travel from one end of the box to the other on two pairs of endless screws, one placed above the other. The fallers only operate on the wool when moving on the upper screws. The wool is forcibly drawn through the pins of the fallers by a pair of rollers which have a higher velocity than the rollers which convey it into the box. 'Gilling' proper is a continuation of what occurs in the latter part of the backwasher. Each gill-box—some six boxes make a set—in which the work of gilling is accomplished possesses two pairs of rollers and a set of fallers. The receiving rollers move slower than the fallers, and the fallers in turn move slower than the delivering rollers, effecting the attenuation of the slivers of the wool, and the straightening of the separate fibres from root to tip, and the grouping of the latter in line order. The drawing-out process is termed the 'draft.' It takes place in every box, whose pins increase in fineness and number, so that the work becomes gradually more searching in character. Should the wool be examined at this stage it would be discovered that, while the longest fibres are comparatively straight, yet the short and curly ones in some instances traverse the ribbon, having escaped the action of the gill-pins of the fallers. By the combing-machine a classification of the fibres is made. The long and the straight are utilised in producing what is called the 'top' or combed wool, while the short, 'neppy,' and curly fibres are rejected, and constitute the noil. Combing also levels the wool.

The types of English machines employed in this work are the Noble, the Holden, and the Nip combs. Noble's machine consists of three circular combs, all of which revolve in the same direction, and are mounted in the interior of the framework of the machine. One of these combs has a diameter varying from 48 to 60 inches. It is called the large circle. Inside it are two smaller combs, with diameters of about 18 to 20 inches. They only work in conjunction with the principal circle at one point in their rotary movement. The ribbons of wool from gilling are brought and placed in the framework of the comb, each ribbon being passed through its own feed-box. The laps of wool are now pressed by what is called the 'dabbing' brush between the teeth of the comb of the large and small circles. Combing begins at this juncture, for each circle carries off in the teeth of its comb a quantity of fibres. As the angle between the combs increases, the fibres are drawn out and levelled, the longest, which hang in the form of a fringe on the inside of the large comb and on the outer edge of the small ones, are combined to make the 'top;' while the short and curly fibres, which become imbedded in the pins of the small circles, are removed by knives set between the rows of pins of which the combs consist. The extraction occurs each time the lesser combs revolve, so that it is impossible for the noil or unsuitable fibres to accumulate. All the combings, two from the large and one from each of the small circles, are collected together and passed into a funnel, when a degree of false twist is imparted as the combed 'top' is being conveyed from the machine.

Levelling is performed by frequently drawing out or drafting and doubling the ribbons. Each compound process of drafting and doubling not only further straightens the wool, but yields a result that closer and closer approaches in appearance a spun thread. *Drawing* primarily produces a uniform ribbon, or one in which the several kinds of fibres are regularly distributed throughout its length; and secondly, it forms a slubbing of such fineness that on imparting twist, and further drafting, a spun and weavable thread will result. All drawing-frames consist of two pairs of rollers, the 'deliverers' revolving at a higher speed than the 'receivers,' or the pair which bring the wool into the frame. As the ribbons are stretched between these rollers they are elongated, or drafted. In a series of frames the amount of drawing and doubling to which the wool is submitted reaches the enormous number of fully five and a half millions of changes. On leaving the roving-frame, which may be regarded as the final 'drawing,' the thick thread acquired is ready for Spinning (q.v.). The French or Continental system of worsted yarn preparation is dissimilar in principle, and also in the mechanism applied, to that described, but it acquires a corresponding type of thread structure. The wool, after carding, is combed in the Heilman machine, which is specially adapted to the treatment of short-stapled materials, including cotton and silk. In the drawing operations no twist is inserted into the slivers or slubbings, the latter being given a yarn consistency by running them betwixt rubber surfaces, having a rotary movement and lateral traverse. Drafting and doubling down

the scheme of drawing, for levelling the sliver, and for obtaining a roving with the fibres straight and in a line with each other, are duplicated and practised as in the English frames. Spinning takes place on the self-actor, but with 'roller' and not 'spindle' drafting as in woollen yarn production. One advantage of the system is, that it provides for the admixture of combed tops of wool and cotton or other class of fibre, and yet secures a yarn of a worsted quality and filament composition and grouping. On the English principle, in addition to the combing of wools from 1½ to 16 or 18 inches in length, cashmere, alpaca, and mohair are also manufactured into yarn of a worsted character. The mechanical plan originated and applied in this country, which is in force in the centres of worsted industry abroad, has a greater compass in the manipulation of staple measurement than that introduced and developed in France, Belgium, and Germany.

Worsted manufacturing is now as important a branch of the textile industry as woollen manufacturing. Still the fancy section is of modern growth. Up to 1870 worsted cloths were invariably piece-dyed, the attempts at using fancy yarns in these fabrics having been chiefly confined to the weaving of figured and spotted vestings; but in that year the late Professor John Beaumont designed the first hank-dyed worsted yarn coatings and suitings. These were produced in Huddersfield, in which town the highest grade of worsteds for men's wear have for some time been manufactured. Bradford, on the other hand, is the home of the fine worsted dress and mantle trades, the productions of its looms competing in style and finish with those emanating from the textile establishments of Roubaix and other manufacturing towns of the north of France. But it must not be inferred from this that worsted-weaving is confined to a limited area in Britain. Leeds and the west of England possess numerous and important mills occupied in the production of combed-yarn fabrics, whilst in some of the tweed-mills of Scotland quantities of worsted suitings are made.

One drawback to the worsted texture is that it assumes, in the wear of the made-up garment, a shiny or glossy appearance, a defect that cannot be obviated without destroying other valuable and characteristic qualities which the fabric possesses. It is a natural sequence to the system of worsted yarn construction. A symmetrically arranged thread is aimed at, and to acquire this much of the natural curliness of the wool fibre is combed out, and a quantity of the short curly hairs, which give fullness of touch and wearing power to the woven fabric, is extracted. The effect is a fabric that is liable to wear shiny, and one that is more porous in structure and less kind in the hand than the carded yarn production. For general serviceability the worsted texture is not comparable with the woollen. Certainly it has its advantages. It is smarter than the woollen, and presents a smoother and more attractive surface. If freshness of design, novelty of textural construction, and fineness of fabric are desiderata, worsted yarns should be selected; but if the intention is to produce a cloth distinguished by softness and elasticity, mellowness of colour, tone, and warmth in the wear, it is important to employ yarns made on the woollen principle of manufacture.

Worsted woven productions include every description of texture from the light blouse and dress stuff to the heavy suiting and overcoating, and, in decorative textiles, plush, tapestries and carpets. On the other hand, woollen productions cover the range and thickness of cloth from the thin flannel to the fleecy blanket, with figured goods in shawls, rugs, and fabrics for domestic application. Both woollen and worsted yarns are further largely employed in the hosiery and knitting trades.

The World's Wool Clip.—Generally speaking, the domestic wools of most European countries, and also of the United States of America, are consumed in the home markets, so that in a literal sense the wool-exporting countries are those of the British empire and of South America. A shortage of the finer wools, particularly merinos, is due to the growing demands of the United States, and the urgency and volume of the requirements of home and Continental concerns. Government action is called for with a view of conserving and developing the wool-growing resources of the overseas dominions, and for improving and augmenting the yield of native classes of fleeces. Ireland offers a promising field for this object, and heavier clips might, by improved scientific and technical practice, be obtained from the breeds of sheep in the northern, the midland, and the western counties of England, as also from parts of Scotland and Wales.

See Beaumont's *Woollen and Worsted* (3d ed. 1919), *Standard Cloths: Structure and Manufacture* (1916), *Finishing of Textile Fabrics* (1912), *Union Textile Fabrication* (1919); *Dress Cloths* (1921); *Wool Substitutes* (1921); Bowman's *Structure of the Wool Fibre* (2d ed. 1906); M'Laren's *Woollen and Worsted Spinning* (1894); Priestman's *Wool Combing* (1904); Rennel's *Laine Peignée et Cardée*, and Alcan's *Traité du Travail de la Laine Cardée;* also Sheep, Carpets, Flannel, Shawls, Weaving, &c.

Woolf, Virginia, novelist, daughter of Sir Leslie Stephen, married in 1912 Leonard Woolf, known as a publicist and writer on social questions. Her first book, *The Voyage Out* (1915), was followed by a collection of short stories, *Monday or Tuesday* (1921), and by the novels *Mrs Dalloway* (1925) and *To the Lighthouse* (1927). Her style is evasive and impressionistic, but vivid and convincing.

Woollett, William (1735–85), engraver to George III. See Engraving, and L. Fagan's *Catalogue Raisonné* of his 123 engraved works (1885).

Woolman, John (1720–72), Quaker preacher, social reformer, and anti-slavery advocate, was born in Northampton, New Jersey, and became a teacher of poor children, and afterwards spent most of his life travelling in the Atlantic States, supporting himself by work as a tailor. His *Journal* tells the story of his journeys, and discloses a pious soul, simply and sincerely. He died in York, England. His works were published in 1774–75; the *Journal* was re-edited, with introduction, by Whittier in 1871 (new ed., with *A Word of Remembrance and Caution to the Rich*, 1900). Charles Lamb was one of Woolman's warmest admirers. See Life by Teignmouth Shore (1913).

Woolner, Thomas, sculptor and poet, was born at Hadleigh, in Suffolk, 17th December 1826, and was educated at private schools till he began his training as sculptor. 'Eleanor sucking the Poison from Prince Edward's Wound' (1843), 'The Death of Boadicea,' and 'Puck' attracted much attention, and were followed by 'Titania,' 'Eros,' 'The Rainbow.' He was closely associated with the Pre-Raphaelites, and contributed some poems to *The Germ*—poems which with others were published in a volume as *My Beautiful Lady* (5th ed. 1892). In 1852-54 he was in Australia; and on his return he rapidly rose to the front rank amongst English sculptors, grace and refinement being the notes of his work. Besides statues of Lord Bacon and William III., he executed statues or portrait busts of most of his famous contemporaries. Other ideal works are 'Elaine,' 'Ophelia,' 'In Memoriam,'

'Virgil,' 'Guinevere,' 'Achilles and Pallas,' 'Lady Godiva Unrobing.' Made A.R.A. in 1871 and R.A. in 1874, he was professor of Sculpture to the Academy in 1877–79. Other poems were *Pygmalion*, *Silenus*, *Tiresias*, and *Nelly Dale*. He died 7th October 1892. See Life by his daughter, Amy Woolner (1917).

Woolsack, the name given to the seat of the Lord Chancellor of England in the House of Lords, whose essential portion is a large square bag of wool without either back or arms, and covered with red cloth, the whole forming a kind of cushioned ottoman, standing near the centre of the chamber. It is believed that woolsacks were placed in the House of Lords in the time of Edward III. to remind the peers of the importance of England's staple trade. An act of Henry VIII. directs that the Lord Chancellor, Lord Treasurer, or other high officer shall sit and be placed at the uppermost part of the sacks in the said parliament chamber, either there to sit upon one form or upon the uppermost sack. D'Ewes says the Lord Keeper sat on the woolsack in 1559, when her Majesty (Queen Elizabeth) was absent; the other woolsacks being as now allotted to the other judges. In 1621 it was declared in the standing orders of the House of Lords that 'the Lord Chancellor sitteth on the Woolsack as Speaker to the House'—i.e. not in his judicial capacity. See *Notes and Queries*, 4th series, vol. iii. p. 384.

Woolsey, Theodore Dwight, was born at New York, 31st October 1801, graduated at Yale in 1820, and after studying in Europe was professor of Greek at Yale from 1831 to 1846, and then its president till 1871. In 1871–81 he was president of the American company of revisers of the New Testament. Besides editions of Greek plays, &c., his works include books on international law, divorce, and political science. He died 1st July 1889.

Woolsorter's Disease. See Anthrax.

Woolston, Thomas, an eccentric Deist, was born at Northampton in 1670, entered Sidney Sussex College, Cambridge, in 1685, became a fellow, and took orders. The study of Origen and his allegorical interpretation of the Scriptures influenced him profoundly, and seems at last to have turned his head. In 1705 he published the *Old Apology for the Truth of the Christian Religion against the Jews and Gentiles revived*. Here Woolston maintained that Moses was only an allegorical personage, and all his history typical of that of Christ; that the miracles of the Pentateuch were allegorical, and the miracles attributed to Christ and the apostles pure allegory too; and he stigmatised as atheists and apostates all who received the Scripture narratives as literally, historically true. In subsequent publications he went further in the same direction; also maintaining that the Quakers approached more nearly in doctrine and organisation to the primitive church than any other religious body; and denouncing clergymen, because they made a profession of the pastorate, as 'hireling priests,' worshippers of the Beast, and ministers of Antichrist. In 1721 his college deprived him of his fellowship. Woolston developed his views more fully in *The Moderator between an Infidel and an Apostate* (1725), the former being Anthony Collins, the latter the modern Anglican clergy who had fallen away from the allegorical method of the Fathers and become priests of the letter. This work, which questioned the virgin-birth and resurrection of Christ, occasioned great scandal, and it was only through the intervention of Whiston, whom he had attacked, that the author escaped a prosecution. His famous series of six *Discourses on the Miracles of Christ* appeared from 1727 to 1729, with two *Defences* in 1729 and 1730. Here he maintained his opinions with much vulgar and offensive iteration. No less than sixty answers were made to the *Discourses;* but what was much worse, an indictment for blasphemy was brought against the writer. He was tried before Chief-justice Raymond at the Guildhall, sentenced to be imprisoned for a year, to pay a fine of £100, and find securities to the amount of £2000 that he would not repeat his offence. He was imprisoned in the King's Bench, and the remainder of his life was spent within its rules. There he died, 27th January 1733.

His works were collected in 1733 in 5 vols. with a Life. See Leslie Stephen's *History of English Thought in the 18th Century* (1880), and the works on Deism by Leland, Lechler, and Sayous.

Woolwich, a parish once in Kent, part of the royal manor of Eltham, on the river Thames, 9 miles below London Bridge. With Eltham and Plumstead, it now forms the metropolitan borough of Woolwich, which has sent since 1885 one member, since 1918 two, to parliament, and has a pop. (1921) of 140,389. The chief part of the town lies on the south bank of the river, but there are small areas (North Woolwich) on the north side. A free steam ferry or floating bridge carrying vehicles connects the two portions. The town is chiefly important on account of the Royal Arsenal, employing normally some 20,000 men (110,000 during the Great War). This establishment may be said to date from 1585, when Queen Elizabeth had a store of arms and armour at the Tower House, a mansion in Woolwich Warren adjoining the then boggy and unhealthy marshes of Plumstead. Prince Rupert protected the King's Warren with batteries in Charles II.'s reign, and other fortifications were added by that king's successor. The Dutch had several times threatened the dockyards here and at Chatham, and in 1695 two French privateers were captured off Woolwich. These fortifications have now disappeared. After the Moorfields explosion in 1716 the proof of ordnance was transferred from Moorfields to Woolwich; guns began to be cast there, carriages constructed, and powder stored. From these works grew the three great departments of the Royal Arsenal called respectively the Royal Gun Factories, Royal Carriage Department, and Royal Laboratory. But these names were not given until after the second visit to the Warren of George III. in 1805. The establishment then grew rapidly in importance and extent. Guns of all sizes, every form of military wagon, shot, shell, torpedoes, cartridges, bullets, war, signal, and life-saving rockets, tubes, and fuses have since always been produced there, small-arms being made at Birmingham and Enfield, and powder, gun-cotton, and other explosives at Waltham. The wharves were enlarged by convict labour. A canal first and then lines of railway were constructed, together with piers and powerful steam and hydraulic cranes. Extensive practice ranges also were added in the Plumstead marshes, which had been carefully drained and embanked against the river. Machinery of the best and most modern type fills the workshops, and immense quantities of all kinds of war-like stores are collected, ready for issue either to the army or to the navy of the empire.

Woolwich is the headquarters of the Royal Regiment of Artillery, of the Army Ordnance Corps, of the Army Service Corps, &c. The barracks occupied by the troops are very imposing buildings. The Herbert Hospital, built soon after the Crimean war at the south end of Woolwich Common, is one of the largest military hospitals in Great Britain. The common itself, nearly half a square mile in extent, forms an excellent drill-ground. Opposite to it are the handsome buildings of the Royal

Military Academy. This, the oldest military school in the kingdom, dates from 1741, when forty cadets were quartered in the arsenal for training in artillery and engineer duties. Another military educational establishment at Woolwich is the Artillery College, for giving special training to officers of the Royal Artillery, in order to fit them for appointments in the manufacturing departments of the Royal Arsenal, &c. It is located in the red barracks, built originally as a hospital for the marines, one division of which corps was quartered at Woolwich until 1869. In this year the Royal Dockyard at Woolwich was closed, as it was found unsuitable for modern ships of war, but it continues to be used as a military store depôt. It was the first and for long the principal dockyard in the kingdom. The *Great Harry* was built there in 1562, the *Royal George* in 1751, the *Galatea* in 1859, and more than 200 other ships.

At the north-west end of the common is the Repository, enclosed with a breast-work, and containing drill-sheds and materials for shifting heavy guns, building military bridges, &c., and the Rotunda Museum of military antiquities and models. Part of the Repository enclosure is laid out as a pleasure-ground. Close to the Rotunda is a small observatory belonging to the Royal Artillery Institution, which is itself part of the artillery barracks, and contains a valuable library, many military relics, and a lecture hall for the discussion of papers on military subjects. St George's Garrison Church, near the artillery barracks, opened in 1863, is one of the most conspicuous buildings in the town. Woolwich, whose greatest sons were General Gordon, Richard Lovelace the poet, and Henry Maudslay, engineer and inventor, has gradually become a suburb of London. Plumstead on the east and Eltham on the south are included in the borough, which is bounded by Charlton on the west. It is the second largest of the metropolitan boroughs. The parish of Woolwich is wholly populated, but parts of Plumstead and Eltham are still capable of development, although building in the latter is proceeding at a rapid pace. The borough possesses a fine town-hall in Wellington Street, Woolwich, and a war memorial hospital on Shooters Hill (1927). It has four public libraries at Woolwich, Plumstead, Eltham, and North Woolwich, with a museum at the Plumstead library. See Artillery, Cannon, Fuse, Military Schools, Rocket, Shell, &c.

Woonsocket, a town of Rhode Island, on both sides of the Blackstone River, 38 miles by rail SW. of Boston, with manufactures of iron, rubber, and especially cottons and woollens. Pop. (1880) 16,050; (1900) 28,204; (1920) 43,496.

Woorali. See Curari.

Wooster, capital of Wayne county, Ohio, on Killbuck Creek, 135 miles by rail W. by N. of Pittsburgh, is the seat of a Presbyterian university (1866) and an agricultural experiment station; pop. 8200.

Worcester, the county town of Worcestershire, 27½ miles by rail SW. of Birmingham, 65½ NNE. of Bristol, and 121 (by road 111) WNW. of London. It stands on the left bank of the Severn, here crossed by a five-arch stone bridge (1781–1841), 270 feet long. Previously perhaps a station of the Romans, *Wigornaceaster* became in 679 the seat of a Mercian bishopric, whose cathedral is Worcester's chief glory. It is a double cross in plan, 410 feet long, 126 wide across the west transept, and 60 to 67 high, with a central tower of 196 feet. Rebuilt from 1084 onwards, and restored since 1857 at a cost of £100,000, it is mainly Early English and Decorated in style, but retains a very interesting Norman crypt, and has Perpendicular features. The simplicity, if not plainness, of the exterior is amply compensated by the fine perspective of the lofty groined roof, and the general noble effect of the interior. One may specially notice the columns of Purbeck marble, the 14th-century choir-stalls and misereres, the elaborate modern reredos, the circular chapter-house, the splendid peal of twelve bells, and the tombs of King John, Prince Arthur, Lord Lyttelton, the Earl of Dudley, and (in the cloisters) 'Miserrimus,' a not very wretched Nonjuror. At Worcester, alternately with Hereford and Gloucester, are held the festivals of the 'Three Choirs.' The old episcopal palace is now the deanery, the present palace since 1842 being Hartlebury Castle, 11 miles N.; and the cathedral school (1541) occupies the superb 13th-century refectory of a Benedictine priory. There is also Queen Elizabeth's school (1561). Nothing remains of the castle, and the Guesten Hall was ruthlessly pulled down in 1860–2; but there are a fine hall called the Commandery, a gatehouse ('Edgar's Tower'), and a good many old timbered houses, while of public buildings may be noticed the guildhall (1723), the shire-hall (1835), and the museum and free library (1836–79). The city is well equipped with public parks and recreation grounds, and there is an excellent supply of water and of electricity. Worcester is the seat of such well-known industrial establishments as the Royal Porcelain Works dating from 1751, the glove-manufactories of Dent and of Fownes (a Glovers' Company was incorporated in 1497), and the 'Worcester Sauce' factory of Lea and Perrins; besides great nurseries, and manufactories of cider, perry, vinegar, chemicals, iron goods, carriages, ropes, and leather. In the neighbourhood are hop-yards. Worcester is a municipal borough, chartered by Richard I. in 1189; a parliamentary borough, returning one member; and also, since 1888, a county borough. Pop. (1851) 27,528; (1901) 46,623; (1911) 47,982; (1921) 48,833. Worcester was the scene of numberless sieges from the time of the Danes down to the 'crowning mercy' of Cromwell, when, on 3d September 1651, he routed Charles II., killing 4000 and making 7000 prisoners. Charles afterwards commemorated the loyalty of the citizens by granting them the motto of 'Civitas fidelis.' Natives of Worcester and its neighbourhood have been the alchemist Kelly, Lord Somers, Mrs Henry Wood, Sir Edward Elgar, Sir Thomas Brock, B. W. Leader, R.A., &c.; whilst among the bishops have been St Dunstan, St Oswald (961–992), St Wulfstan (1062–95), Walter Cantilupe, Simon de Montfort's adherent (1237–66), Latimer (q.v.), Whitgift (q.v.), Gauden (see Eikon Basilike), Stillingfleet (q.v.), Hough, Hurd (q.v.), Perowne (q.v.), Gore (q.v.). —For Florence of Worcester, see that article.

Worcester, a capital of Worcester county, Massachusetts, and the second city of the state, is pleasantly situated in a valley and on the surrounding hills, on Blackstone River, 44 miles by rail WSW. of Boston. Several suburban villages are included within the 36 sq. m. of the municipality. 'The Academic City' contains, besides excellent public schools, Clark University and College, the state normal school, a polytechnic, a military institute, high school, Jesuit college, Baptist academy, a large women's school, &c. Its churches include many handsome buildings, and from the porch of the Old South Church the Declaration of Independence was first read in Massachusetts. It manufactures boots and shoes, wire and iron products, and woollens. The university was founded (1887) by Jonas Gilman Clark (1815–1900), tinware and banking millionaire. Pop. (1880) 58,291; (1910) 145,986; (1920) 179,754; (1925) 190,257.

Worcester, a town of the Cape Province, 65 miles E. by N. of Capetown, is a thriving agricultural and industrial centre; pop. 8500.

Worcester, EDWARD SOMERSET, MARQUIS OF, inventor of the steam-engine, was born about 1601, probably at Worcester House in the Strand, the eldest of the thirteen children of the fifth Earl and first Marquis of Worcester (*c.* 1577–1646). He was brought up at Raglan Castle, and in 1628 married Elizabeth, daughter of Sir William Dormer, soon after which we find him engaged in mechanical pursuits in conjunction with the 'unparalleled workman,' Caspar Kaltoff, his life-long assistant. His first wife died in 1635, leaving him one son and two daughters, and in 1639 he married Lady Margaret O'Brien, daughter and co-heiress of the Earl of Thomond. A devout Roman Catholic, during the Great Rebellion he cast in his lot from the first with the king; in 1642 was made General of South Wales; in 1644 was created Earl of Glamorgan, having till then borne the courtesy title of Lord Herbert; and in 1645 was despatched to Ireland to raise troops for the king's service. His mission—a secret one—miscarried; and, Charles disowning him with characteristic duplicity, he was for a brief space imprisoned. In 1646 he succeeded his father, who had stoutly defended Raglan Castle against the Roundheads; and in 1648 he went into exile in France. In 1652, venturing back to England, he was sent to the Tower, but in 1654 was let out on bail, and at the Restoration recovered a portion of his vast estates—he claimed to have disbursed £918,000 'for king and country.' He died in London, 3d April 1667, and was buried at Raglan. His *Century of Inventions*, written in 1655, but first printed in 1663 (more than twenty times reprinted), gives a brief account of a hundred inventions—ciphers, signals, automata, mechanical appliances, &c. No. 68 deals with 'an admirable and most forcible way to drive up water by fire'—the steam apparatus which could raise a column of water to the height of 40 feet, and which seems to have been actually at work at Vauxhall from 1663 till 1670, Cosmo de' Medici III., Grand-duke of Tuscany, having seen and described it in 1663.

See the *Life of the Marquis of Worcester* (1863), by Henry Dircks, prefixed to his annotated reprint of the *Century*.

Worcester, JOSEPH EMERSON, lexicographer, was born at Bedford, New Hampshire, August 24, 1784. Although employed in youth in agricultural labour, he gave himself a liberal education, entered Yale College in 1809, and graduated in 1811. For some years a teacher at Salem, Massachusetts, he gave his life thereafter to continued literary labours down to its close at Cambridge, Massachusetts, October 27, 1865. All his works were laborious, but most of them unhappily ephemeral: gazetteers, manuals of geography and history, the *American Almanac* (1832–43). He prepared an edition of Chalmers' abridgment of Todd's Johnson's Dictionary, together with Walker's Pronouncing Dictionary (1828), abridged Webster (1829), and printed his sound and sensible *Comprehensive Pronouncing and Explanatory English Dictionary* (1830; enlarged ed. 1855). His *Universal and Critical Dictionary* followed in 1846; his great quarto *Dictionary of the English Language* in 1860.

Worcester College. See OXFORD.

Worcestershire is an inland English county of very irregular outline, bounded on the N. by Shropshire and Staffordshire, E. by Warwickshire and Oxfordshire, S. by Gloucestershire, and W. by Herefordshire and Shropshire. Its extreme length is 50 miles, and its greatest breadth 26 miles; but from the irregularity of its borders its area is but 716 sq. m. Pop. (1801) 146,445; (1851) 276,926; (1881) 380,283; (1911) 526,087, or as reduced by the extension of Birmingham, 387,688; (1921) 405,842. The Severn is the chief river, and is navigable throughout from Bewdley to Tewkesbury, passing by the city of Worcester. The Warwickshire or Upper Avon, which enters Worcestershire near Cleeve, and passes by Evesham and Pershore, falling into the Severn at Tewkesbury, is also navigable. The other rivers of the county are mostly feeders of these two—the Stour, the Salwarp, and the Teme of the Severn, and the Arrow of the Avon. A small portion of the north-east corner of the shire lies in the basin of the Trent. The canals were of great importance before the development of the railway system, the Stourport uniting the Trent and Severn navigations, and the Worcester and Birmingham leaving the Severn at Diglis, and connecting at Birmingham with the general canal system. The railways are the London Midland and Scottish and the Great Western. The surface of the shire is diversified and picturesque, with many landscapes of great beauty. The chief hill range is that of the Malverns, on the border next Hereford; the Cotswolds stretch between Worcester and Gloucester; the Clents command part of the Warwick and Stafford frontier, chiefly of the 'Black Country;' the Lickey range is more central. The Clee Hills lie well to the north-west in Shropshire, but high broken ground stretches thence to the verge of Worcestershire in the romantic forest of Wyre. It is to the constant presence of one or other of these bold upland regions that the valleys of the Severn and the Avon owe that singular combination of sylvan and pastoral beauties which makes the landscapes of the county typical of some of the most characteristic and attractive phases of English scenery. The geology of Worcestershire is varied and interesting. Triassic rocks occupy most of the central region, with the Lias and Oolite of the Cotswolds on the south, and on the north Permian, Carboniferous, and Devonian. In the upland to which the Clent and Lickey Hills belong Silurian and Archæan rocks occur, and in the Malvern range Silurian, Cambrian, and Archæan. Taken in connection also with their igneous features, the Malvern Hills are almost unsurpassed for geological interest in the kingdom. The Rowley Rag basalt in the north-east corner of the county is noteworthy. The Silurian strata of Dudley are highly fossiliferous, and there are a number of good fossil localities in the Malverns and near—chiefly Silurian and Devonian. The mineral wealth of Worcestershire has had chief influence on its more recent history. As a whole it is a highly fertile agricultural region, with upland sheep-walks, productive tillage ground, and a very extensive fruit-growing area. Plums, pears, and apples are grown in enormous quantities, the neighbourhood of Pershore being the chief plum-growing centre in the kingdom, while the apples and pears are largely used in the manufacture of cider and perry. The more northern districts are, however, chiefly engaged in manufacture. Salt has been raised from the brine-springs at Droitwich (fed by immense beds of rock-salt in the Trias) certainly for more than 1000 years. The manufacture of iron, carried on by the Romans, has developed into the busy industries of the unlovely 'Black Country,' of which Dudley, with iron-mines and collieries, is the chief centre. Special branches of iron and steel industries are represented by the chain manufacture at Cradley and Netherton; nail-making at Halesowen and Bromsgrove, with edge-tools and smaller wares; while Redditch and Feckenham make needles and fish-hooks. Other developments of local mineral resources are seen in the fireclay

goods of Stourbridge, and the glass wares produced there and at Stourport. The famous porcelain-works of Worcester have not the same immediate local connection. In the middle ages a great deal of cloth was made, which may now be regarded as represented by the carpet-weaving of Kidderminster; and there is another important local industry in the gloving of Worcester city.

Little is known of the early history of the county, but the Romans seated themselves at Worcester as a frontier town when they defeated the Silures. In Saxon days it first fell into the hands of the Hwiccas, and then became part of Mercia. The shire chiefly finds place in the national life in connection with its city; but three of the great decisive battles of English history were fought wholly or in part upon its soil. At Evesham, August 4, 1265, Simon de Montfort was defeated and slain; at Tewkesbury, May 4, 1471, the Lancastrians under Margaret suffered their sorest defeat; at Worcester, September 3, 1651, Cromwell gained his 'crowning mercy.' Some of the most active participators in the Gunpowder Plot were associated with Worcestershire (see SECRET CHAMBERS). Antiquities of the older type are not numerous; still there are some fine earthworks, and those on the Herefordshire Beacon, the highest point but one of the Malverns, are among the finest in England. (This hill is 1370 feet high; the Worcestershire Beacon, the highest point in the county, 1395 feet.) The architectural antiquities of the county are chiefly ecclesiastical. There is remarkably fine Early English work in the cathedral, with a very noteworthy Norman crypt, and much that is interesting in the remains of the religious houses, as at Malvern, Pershore, and Evesham. There are many half-timbered dwellings, some of great merit. The changes in the civil organisation of the county have not been great. Before 1832 the shire had nine members; Dudley and Kidderminster were then enfranchised, and the total increased to twelve; at present (since 1918) there are six, one each for four county divisions, and for Worcester and Dudley. Worcester and Dudley are county boroughs, and the other boroughs are Bewdley, Droitwich, Evesham, Kidderminster, and Stourbridge.

See works by T. R. Nash (2 vols. 1781–99), J. Chambers (worthies, 1820), Sir C. Hastings (nat. hist. 1834), G. E. Roberts (geology, 1860), Lees (botany, 1867), J. Noake (1868 and 1877), W. Niven (old houses, 1873), R. N. Worth (1889), Brassington (1894–95), Habington (1899), Mawer and Stenton (place-names, 1927), and the 'Victoria History' (1901 *et seq.*).

Worde, WYNKYN DE, born perhaps at Wörth in Alsace, came as a youth about 1477 to assist Caxton (q.v.) in printing, and he was still living in 1535. In 1491 he succeeded to the stock-in-trade of his deceased master, but he did not append his name to his books till 1493. From about 1502 onwards he worked in Fleet Street at the sign of the Sun. He used on his books many varieties of Caxton's mark, and Blades gives as many as fourteen variant forms of his own name. Wynkyn de Worde made great improvements in the art of printing, and especially in the art of type-cutting. But it was more likely Pynson than he that first introduced Roman letters into England, using them as we now use italics. The books printed by him are generally distinguished by their neatness and elegance, hardly by their accuracy, nor, a few excepted, by the literary value of their contents. See PRINTING; E. Gordon Duff's *Printers, Stationers, and Bookbinders of Westminster and London in 1476–1535* (1906); H. R. Plomer, *Wynkyn de Worde and his Contemporaries* (1925).

Wordsworth, CHRISTOPHER, youngest brother of the poet, was born at Cockermouth in Cumberland, June 9, 1774. From Hawkeshead grammar-school he passed in 1792 to Trinity College, Cambridge, and was elected a fellow in 1798. Successively rector of Ashby-with-Oby and Thirne in Norfolk (1804), dean of Bocking, Essex (1808), rector of St Mary's, Lambeth, Surrey, and of Sundridge in Kent (1815), he exchanged these two last livings for the rectory of Buxted-with-Uckfield, Sussex, in 1820. He was master of Trinity College, Cambridge, from 1820 until 1841, when he retired to Buxted, where he died, February 2, 1846. His best-known book is his *Ecclesiastical Biography*, a fine collection of selected and annotated lives (6 vols. 1809; 4 vols. 1839). His books, *Who wrote Icōn Basilikē?* (1824) and *King Charles the First the Author of Icōn Basilikē further proved* (1828), are learned if not conclusive. His *Christian Institutes* (4 vols. 1836) is a good selection from the writings of the great English divines.—Of his sons, the eldest, JOHN WORDSWORTH, was born at Lambeth, July 1, 1805, became a fellow of Trinity College, Cambridge, in 1830, took orders in 1837, and was preparing an edition of Æschylus and a classical dictionary, when he was surprised by death, December 31, 1839.—The second son, CHARLES WORDSWORTH, was born at Lambeth, 22d August 1806, passed from a private school to Harrow in 1820, and thence in 1825 to Christ Church, Oxford, where he gained the college and university prizes for Latin hexameters (1827), and graduated with a first-class in 1830. While an undergraduate he had played in the first cricket-match and rowed in the first boat-race between the universities. In 1830 he became private tutor, among his first pupils being Gladstone and Manning, and in 1834 public tutor at Christ Church, and was ordained deacon in 1835; he did not proceed to priest's orders until 1840. From 1835 to 1846 he was second master at Winchester, and then till 1854 warden of the new Episcopal college at Glenalmond (q.v.) in Perthshire. In 1852 he was elected Bishop of St Andrews, and for years thereafter was one of the foremost figures in Scottish ecclesiastical life, which he did much to sweeten by his numerous writings in favour of reunion between the churches. He was one of the New Testament revisers. His many works include, among others, the well-known Greek grammar (first published in 1839); *Shakespeare's Knowledge and Use of the Bible* (1854; 4th ed. 1892), and *Shakespeare's Historical Plays* (3 vols. 1883); sermons, charges, and a collection of discourses and charges published as *Public Appeals on Behalf of Christian Unity* (2 vols. 1886); and the valuable *Outlines of the Christian Ministry* (1872; new ed. 1893). See his *Annals of My Life* (2 vols. 1891–93). He died 5th December 1892.—The youngest son, CHRISTOPHER WORDSWORTH, was born at Bocking, October 30, 1807, and had his education at Winchester and Trinity College, Cambridge, where he carried off the Chancellor's medal for his poem, *The Druids* (1827), the Browne medals for the Latin ode and Greek epigram (1828), and graduated senior classic in 1830. He travelled in Greece in 1832–33, took holy orders, was elected fellow of his college in 1830, and in 1836 public orator to the university. He was an unsuccessful head-master of Harrow from 1836 till 1844, when he became canon of Westminster, was appointed vicar of Stanford-in-the-Vale, Berkshire, and rural dean in 1850, archdeacon of Westminster in 1865, and in 1868 was raised to be Bishop of Lincoln. He died at Lincoln, March 20, 1885, only a few weeks after resigning his see. His ideal of episcopal duty was high, but he lacked that breadth of view and of sympathy necessary to make a really great administrator. He was obstinate, incapable of seeing when he was in the wrong, and often harsh in phrase, but the singleness of his aims

and his real nobility of character commanded the respect of all men. His *Athens and Attica* (1836), *Inscriptiones Pompeianæ* (1837), *Greece: Pictorial, Descriptive, and Historical* (1839; revised by H. F. Tozer, 1883), *Theocritus* (1844), and even *Conjectural Emendations* (1884) were sound contributions to classical scholarship. In 1842 he edited the *Correspondence of Bentley*, but he cannot in any sense be said to have achieved success in his Memoir (1851) of his illustrious uncle, the poet. Other works were his *Theophilus Anglicanus* (1843), Hulsean Lectures on the Canon (1848) and on the Apocalypse (1849); *S. Hippolytus and the Church of Rome in the Third Century* (1853); *The Greek New Testament* (1856–60); and *The Old Testament in the Authorised Version* (6 vols. 1864–71), a vast work of labour and research of the pre-scientific stage of such scholarship; *Miscellanies, Literary and Religious* (3 vols. 1878); and a *Church History to the Council of Chalcedon, 481* A.D. (4 vols. 1881–83); besides countless sermons and vigorous but one-sided controversial pamphlets and treatises on such questions of the day as baptism, secession to Rome, secular education, tithes, divorce, marriage with a deceased wife's sister, cremation, confession, Wesleyanism, sisterhoods, future punishment, the Revised Version, &c. See the Life by J. H. Overton and E. Wordsworth (1888).—The eldest son of the last, JOHN WORDSWORTH (1843–1911), was born at Harrow, had his education at Ipswich, Winchester, and New College, Oxford, graduated with a classical second class in 1865, and carried off the Chancellor's prize for a Latin essay (1866) and the Craven scholarship (1867). For a short time assistant-master at Wellington College, he became a fellow of Brasenose College, Oxford, in 1867, and served as tutor from 1868 till 1883. He was a prebendary of Lincoln (1870–83), examining chaplain to his father (1870–85), Grinfield lecturer on the Septuagint (1876), Bampton lecturer—*The One Religion* (1881), from 1883 professor of the interpretation of Scripture and canon of Rochester, and from 1885 Bishop of Salisbury. His chief books are *Fragments and Specimens of Early Latin* (1874), *University Sermons* (1878), *Old Latin Biblical Texts*—I. (1883; vols. ii. and iii. mainly by others); a critical edition of the Vulgate New Testament (1889 *et seq.*; continued by Dr H. J. White); *Teaching of the Church of England*, for Eastern Christians (1900); *The Ministry of Grace* (2d ed. 1903); *Family Prayers* (2d ed. 1905); *The National Church of Sweden* (1911). See Life by Canon E. W. Watson (1915).

Wordsworth, DOROTHY, only sister of the poet, was born at Cockermouth on Christmas Day 1771. She set up housekeeping with her brother in the autumn of 1795 at Racedown Lodge in Dorsetshire, next at Alfoxden for a year (1797–98), enduring a noble poverty, then spent six months with him in Germany, and lived afterwards with him until the end at Grasmere and at Rydal Mount. His marriage in 1802 only widened the circle of her love. Her *Journals* kept at Alfoxden and Grasmere, and the records of her journeys in Scotland, the Isle of Man, Germany, France, Switzerland, and Italy, reveal a mind as subtly sensitive to nature as the poet's own, and an exquisiteness of expression, which, if he equalled, he never surpassed. Of her own choice she never married, but gave herself entirely for her brother, toiled and planned for him, and walked with him amongst the mountains beyond her strength to help him to see everything that could be turned to poetic use. She made herself a part not only of his life but of his imagination. But she had her reward in a love that never wavered, and that remains enshrined in some of the noblest verse in English literature. Hardly beautiful, bright-eyed and brown as a gipsy, she had a sweetness of nature, an intense sensibility to impressions, and a glowing heart that laid a spell on Coleridge, De Quincey, Charles Lamb, Crabb Robinson, and all who knew her. She had for some years shown signs of growing weakness, when in 1832 she had an attack of brain-fever, from which she never entirely recovered. All hope of recovery was gone by 1836, yet she outlived her brother, and lingered till 25th January 1855. She was laid at the right side of his grave in Grasmere churchyard.

See the Lives of William Wordsworth; Dorothy Wordsworth's *Journals*, edited by Prof. Knight (2 vols. 1897); Edmund Lee's study (1886; new ed. 1894), and C. M. Maclean's (1927).

Wordsworth, WILLIAM, was descended from an old north-country stock, at home in various parts of Yorkshire and Westmorland, and was born 7th April 1770 at Cockermouth, on the Derwent, 'fairest of all rivers,' within sight of the mountains among which were to be his home, his happiness, and his grave. There and at Penrith the child's first years went by, perhaps with little control, for his parents died early: stiff, moody, and violent in temper as he describes himself; the tough, stern dalesman's nature which, softened and elevated, passed into the strong truthful self-dependence, the high moral sentiment, the plainness of phrase which often rendered him misunderstood in later life. Sent to school (1778) at Hawkshead, a singularly picturesque village over Esthwaite Lake, he enjoyed healthy freedom, not, we may believe, without 'the silent thoughts that search for steadfast light,' both in studies and sports: exchanged (1787–91) for far less congenial days at St John's, Cambridge. Here he read widely without plan or academic purpose, yet meditating much, and with a vague but firm hope that his life would leave some achievement 'which pure hearts should reverence.'

In 1790 Wordsworth visited France and Switzerland: France again in 1791–92. Journeys in fact were the most salient events in the poet's quiet outward career. But Wordsworth's two visits to France, besides supplying him with a crowd of motives for song, proved the great determining experience of his life, though in a bent opposite to that which they then seemed to give. The France of 1790, in the genial stage of intoxication with the first draughts of liberty, the 'sublime senselessness of joy,' filled him with enthusiasm: and even the excesses of 1792 (when he barely escaped death in that fatal September) left his republicanism dominant. But his joy was already clouding. The fruit of an unreined passion left him with bodings, and around him he saw the spell of that Masque of Anarchy, soon exchanged for tyranny by invariable sequence, gradually and sadly pass: he recognised that nations must 'stand on the ancient ways' if they are to advance safely; by process of the 'years that bring the philosophic mind,' exchanging the love of the false liberty for that of the true. In Dean Church's fine phrase, the trial and the struggle he went through 'annealed his mind to its highest temper.' And henceforth a passionate devotion to England, felt 'as a lover or a child,' and deep as Shakespeare's or Tennyson's, possessed him:

> Ah! not for emerald fields alone,
> With ambient streams more pure and bright
> Than fabled Cytherea's zone
> Glittering before the Thunderer's sight,
> Is to my heart of hearts endeared
> The ground where we were born and reared!

Two poems in 'heroic' metre were Wordsworth's first step towards publicity (1793): the *Evening Walk* and *Descriptive Sketches*, written 1787–92; the latter reflecting his Swiss and earlier French

experiences. 'Seldom, if ever,' Coleridge wrote (1817) 'was the emergence of an original poetic genius more evidently announced.' But this and the next two years, whilst the darkness gathered deeper over France, were a time of restlessness and misery to Wordsworth: he was passing through the throes of personal poverty, of mental disillusion and renaissance, and his soul was distressed over the imprudent liaison with Annette Vallon of Blois, who bore him a daughter in 1792. In 1795 Calvert, a young friend, left him £900, a sum which to Wordsworth was competence. Encouraged thus, and by the presence of his loved and gifted sister Dorothy, 'sister of his soul,' he now consciously 'found himself,' taking poetry alone as 'his office upon earth.' Settling at Racedown near Crewkerne (1796), Wordsworth first saw the great Coleridge, another critical moment in his poetic development: moving (1797) for Coleridge's neighbourhood, to Alfoxden by the Quantocks. That beautiful district, and a tour by the Wye, bore fruit in his *Lyrical Ballads* (1798): republished, with a second volume (1800). After some months in North Germany, he moved to the fair region he was so splendidly to make his own, settling first (1799) at Grasmere. These fertile years (1798–1808) were crowned with happiness by marriage (1802) with Mary Hutchinson, a childhood love renewed. In 1805 he finished the autobiographical *Prelude*, deferred for publication during his lifetime: 1807 gave us two fresh volumes, recording many experiences of life, many of his most memorable poems:—of which, hereafter. Some of his most perfect work was then due also to the journey to Scotland (1803) in his sister's inspiring company.

Few events remain for notice. 1814 and 1832 saw more visits to Scotland; the last noteworthy as the farewell to Walter Scott. Though working on very different lines, respect and love united these two great writers: and we may here name among Wordsworth's friends, Coleridge, Lamb, Southey, Rogers, Sir George Beaumont, Lord Lowther, his own brothers (of whom John, to his great grief, was drowned in 1805); with several noble-natured and gifted ladies. Many he outlived: but the loss which, though wounding him most, he met with perfect resignation, was the death of his daughter Dora (1847). In 1814 (to conclude our brief bibliography) appeared *The Excursion:* 1815, the *White Doe:* 1819 and 1820 the *Duddon* sonnets and other pieces. 1820 and 1837 mark visits to Italy, deeply enjoyed and utilised in verse, 1822, 1842: in 1835 came *Yarrow Revisited* and *Sonnets to Liberty and Order.*

Some popularity, long deferred, some honours, meanwhile awaited the poet whose career (to take a figure from Coleridge) had so far outstripped his critics that he seemed dwarfed in their eyes. In 1839 Oxford gave him the Doctorate. Most precious, however, in Wordsworth's mind was the heart-felt and noble welcome received from Keble; a poet of whose first work he spoke 'with love and delight,' whilst characteristically and justly dwelling upon its inaccuracy or want of finish in diction: 'I like the volume so much, that, if I was the author, I think I should never rest till I had nearly rewritten it.'—'Very few books,' let us here add from De Quincey, 'sufficed him; he was careless habitually of all the current literature, or indeed of any literature that could not be considered as enshrining the very ideal, capital, and elementary grandeur of the human intellect.' Wordsworth possessed decided opinions upon some of his brethren in art. Horace was his great favourite; Chaucer and Milton he admired; Spenser was always sincere, and Shelley an artist; Goethe was an artificial writer, while, as a poet, Scott could not live; Byron's language was faulty, and *Scots wha hae* was 'poor as a lyric.' If Coleridge had not, in Germany, received the bent to 'metaphysical theology, he would have been the greatest, the most abiding poet of his age.' 'I saw Tennyson when I was in London several times,' he wrote, July 1, 1845. 'He is decidedly the first of our living poets, and I hope will live to give the world still better things.'

In 1842 he resigned the office of distributor of stamps for Westmorland, which he had held for thirty years, and which was worth £400; and received a civil pension of £300, and in 1843 he succeeded Southey in the Laureateship. An almost unbroken felicity attended the last half of Wordsworth's life. 'What he gave to others, and what he most desired for himself,' says a friend, 'was love.' He felt for his friends and family, neighbours and dependents, for children, for the poor, that intense tenderness which his poetry expresses towards what, by a narrow phrase, we call Nature: till, with such euthanasia as human life allows, 'old, yet unchill'd by age,' on April 23, 1850, the great soul made his calm and Christian transit to the spiritual world on which his thoughts had been long devoutly fixed. He had overlived the chilling want of sympathy which original genius never fails to arouse among commonplace minds; he had outlived the mis-estimation of some nobler spirits, and the overpartiality of undiscriminating worshippers; his work for his countrymen, wherever scattered over the world, was at length fairly judged, and found to rank in quality with the best to which England has given birth; and he now rests from his labours in the quiet churchyard at Grasmere, among neighbours and kinsmen, within the bosom of the hills he loved so heartily.

Turning from the Man to the Poet, we may notice Wordsworth's own views upon his art, and his aims: his chief characteristics: certain fallacies current regarding his work: with some notice of the poems as they mark the stages of his life and art. And we shall here rely greatly upon the criticisms which in the maturity of his and his friend's powers, Coleridge published in his *Biographia Literaria* (1817).

To the second issue of his *Lyrical Ballads* (1800) Wordsworth added a Preface with an Appendix, which, with a somewhat later Essay, combined with Coleridge's analysis, should be studied by all who love Poetry wisely as forming (despite certain doubtful propositions) one of the best suggestive outlines of an Art of Poetry. (Aristotle's treatise has reached us in a state too imperfect, and is too exclusively Hellenic in its range to be here in question.) Yet in the forefront of the Preface, Wordsworth laid himself fairly open to hostile criticism by bringing forward as the guiding principle of his poetry a too dogmatic insistence upon 'incidents and situations from common life, tracing in them . . . the primary laws of our nature,' to be related or described 'throughout, as far as was possible, in a selection of language really used by men.' The persons were 'generally' chosen from the labouring ranks, because 'our elementary feelings' are amongst them most simply shown, are capable of most forcible representation, and are 'incorporated with the beautiful and permanent forms of nature.' Hence also the language of these men, somewhat 'purified,' was used; being, from natural circumstances, simpler and truer: 'a more permanent, and far more philosophical language than that which is frequently substituted for it by the poets': and he argues further that between the language of prose and poetry (metre excepted) no definite barrier lies; 'poetic diction' (probably with special reference to 18th-century writers) being carefully excluded from the poems before us.

This theory, as exemplified in the *Ballads*, raised a storm and shout of derision from the critics of the day, which long impeded Wordsworth's popular reception. And doubtless, although phrases occur which really limit the main argument, yet as Coleridge showed in his masterly analysis, Wordsworth assumed, 'in terms at once too large and too exclusive, his predilection for a style the most remote possible from the false and showy splendour which he wished to explode'; seeming, at first sight, to confine truth and simplicity of feeling and language to 'unsophisticated' man, and the incidents hence chosen: he overstated both the poetic possibilities of the speech of common life, and the importance of the conventional diction of the day.

Yet, both in his own age and after, critics exaggerated Wordsworth's positions. His final claim is only that by following his method, genuine poetry of permanent interest and moral value would be produced. And in fact it is but a small proportion of his poems, and those of early date, which are any way thus injured in effect. The general theory of poetical art fills most of the essays; and herein lies their great and lasting value. Pleasure, immediate, pure, durable, exquisite, but not exclusive of painful scenes, he lays down and brilliantly vindicates as always essential to Poetry; 'excitement in co-existence with an overbalance of pleasure': whilst the worthiest objects of the art are 'the external universe, the moral and religious sentiments of Man, his natural affections, and his acquired passions.' Thus Poetry to Wordsworth is 'the breath and finer spirit of all knowledge:' man and his environment are essentially adapted to each other; there is a kind of interplay between him and nature. Hence, in strict accordance with the common voice of the great poets of all ages, he says of himself 'I wish always to be considered as a teacher, or as nothing:' or, as he expressed it, his purpose was 'to console the afflicted; to add sunshine to daylight, by making the happy happier; to teach the young and the gracious of every age to see, to think and feel, and therefore to become more actively and securely virtuous: this is their office.'

This constant dealing with life, as Arnold has remarked, this 'energetic and profound treatment of moral ideas, is what distinguishes the English poetry,' and eminently that of Wordsworth. Yet even with the most poetical poet, the high lesson tends to become dominant over beauty; the moral supersedes pleasure. Wordsworth, to notice here his defects, has hence much that is simply didactic: his intense imaginative gift, his vivid sense of unity, saved him from the prosaic: the lion's grasp is hardly ever wanting: yet a certain heaviness often alloys his longer poems, whether those of meditative reasoning or of narration. In simple metres he has stateliness, he has exquisite sweetness: but he cannot compete with the effortless variety, the ethereal grace of Shelley's short lyrics; with Keats in the splendid wealth, the magnificent music of his odes. Not only is his style curiously unequal, but he had no consciousness of lapse: was at times diffuse and overminute in details: in common with almost every modern European poet, he wrote too liberally. He has images too lofty for the subject: 'not always graceful in the play of fancy,' says Coleridge: and especially in some early lyrics is bald and even clumsy.

Yet, in spite of these defects, the mass of work equally admirable in art and precious in substance, which Wordsworth's eighty years left to posterity, distinctly places him next, in sequence of time, to Milton. Other poets of his period may have been equally gifted; but he was allowed to gather in his whole harvest. Specially we may note his austere, logical, accurate purity and noble plainness in diction, 'impassioned, lofty, and sustained:' with the corresponding 'weight and sanity of the sentiments,' won not from books but fresh from the soul: frequent ingenious happiness of phrase, the *curiosa felicitas* of his favourite Horace: perfect truth, perfect modesty of painting, in his descriptions and images from nature:—so keenly noted and so numerous that, as Tennyson once remarked, 'he always seems to have been before one in observation.' Rising now to the inner spirit of the work, Wordsworth eminently was a merciful judge of his fellow-creatures, with the deepest inborn feeling for the poor, always tender to the ignorant and the erring, grieving 'for the overthrow of the soul's beauty.' Hence he abounds in 'a meditative pathos, a union of deep and subtle thought with sensibility; a sympathy with man as man. Such he *is*, and so he writes,' said Coleridge: who then challenges pre-eminently for him 'the gift of Imagination in the highest and strictest sense of the word.' In this 'he stands nearest of all modern writers to Shakespeare and Milton, and yet in a kind perfectly unborrowed and his own.'

On this singular imaginative power a few words must be added. As a child, Wordsworth's vivid mind unconsciously reproduced the famous ideal philosophy of Berkeley. 'I was often unable,' he writes, 'to think of external things as having external existence, and I communed with all that I saw as something not apart from but inherent in, my own immaterial nature. Many times while going to school have I grasped at a wall or a tree to recall myself from this abyss of idealism to the reality:'—And, shadowy and transient as these strange influences of the childish imagination necessarily were, they lay at the root of that peculiarly spiritual tone with which Wordsworth always looked on the world. When this 'visionary gleam' passed from the yet unconscious poet's eyes, the same imaginative faculty, taking a new but analogous form, presented the world to him as itself actually interfused with living power:

> He felt the sentiment of Being spread,
> O'er all that moves and all that seemeth still;—
> The presences of Nature in the sky
> And on the earth; the Visions of the hills,
> And Souls of lonely places.

Or again, when as a boy he was bird-chasing,

> —moon and stars
> Were shining o'er my head. I was alone,
> And seemed to be a trouble to the peace
> That dwelt among them.

Or once more, with profounder force still, we find him unhesitatingly speaking of

> The Being that is in the clouds and air,
> That is in the green leaves among the groves:—

The Omnipresence of God was surely never more deeply felt, or expressed more deeply.

Wordsworth himself set forth his poetical aim in verse and prose: and high as the aim was, it is not too much to say that he came near as human limitations allow toward accomplishing it. Great force in thought, great power of imagination,—these, by natural law, are the primary elements whence all great poetry has sprung. The fountain of verse can never rise to a higher height,—can, indeed, never absolutely equal the height,—of the well-head of the poet's own nature. The workman is ever greater than the work. But those two capital gifts are combined in various proportions to form the substance of the song: and in Wordsworth's case their union indubitably places him amongst the most spiritual, the most ideal, in the noble army of singers. Very unequal is his poetry; yet, everywhere, as if by natural necessity, even the lowliest themes are lifted to their loftiest

meaning. It was his function 'to breathe Grandeur upon the very humblest face Of human life' :—

> The light that never was on sea or land,
> The consecration, and the Poet's dream,

in their degree, are constantly present.

This nobly meditative mood at once elevates and limits his range. 'Of all poets,' says Dean Church, 'Wordsworth made himself most avowedly the subject of his own thinking.' In the great partition between Objective and Subjective, he counts among the latter. Yet herein we find one of his most conspicuous and delightful characteristics. His subjectivity is itself objective. Speaking for himself, Wordsworth will be found to speak for all of us : it is the common human mind which he perpetually interprets. As if they had never been thought before, he gives back our own thoughts with an exquisiteness and a distinctness all his own :

> I've heard of hearts unkind, kind deeds
> With coldness still returning;
> Alas ! the gratitude of men
> Hath oftener left me mourning.

Lines like these or descriptions of the same quality occur perpetually, and once read, are unforgettable.

If it be a vulgar error that ascribes egoism to Wordsworth's lofty meditative independence, no less is it palpably incorrect to hold him pre-eminently the poet of Nature. The wealth of his landscape, whether in fine details or in larger pictures, (closely analogous to the work of his great contemporary, J. M. W. Turner), is indeed inexhaustible; the delicate accuracy, the 'eye always upon the object,' never absent; and he is ever mindful that the 'forms Of Nature have a passion in themselves, that intermingles with those works of man To which she summons him.' Yet men, 'as they are men within themselves,' are his true theme : heroes and sufferers in lowly life; great characters of all ages; actors in the stormy scenes of war and politics during his youth. 'There is,' as he wrote of his poems, 'scarcely one which does not aim to direct the attention to some moral sentiment, or to some general principle, or law of thought or of our intellectual constitution.' 'He deals with life,' as Arnold puts it; 'and his greatness lies in his dealing with it so powerfully.'

Another, and at first sight a more tenable, error is that Wordsworth's later poetry falls greatly below the earlier : a common narrowness of human judgment from which Scott and other great writers have suffered. The undeniably fuller freshness of his first maturity, which is strongly marked in Wordsworth, seems to have blinded readers to the larger aim, the deeper sentiment, the sweeter truth, of work, perhaps less complete in art, less decorated, whilst essentially loftier. The Sublime, in a word, can never gain the popularity of the Beautiful.

It remains to complete, so far as possible, this imperfect sketch by a rapid view of the poetry itself in its main aspects. Four such may be noted.

I. The two early descriptive poems, in some degree, by diction and metre, remind us that they belong to the 18th century. Their style, as Coleridge observed, is powerful, but at times knotty and contorted; the images crowded to obscurity. Yet splendid lines occur, as when he represents the soul holding 'communion high' with God,

> There, where the peal of swelling torrents fills
> The sky-roofed temple of the eternal hills.

The *Guilt and Sorrow*, (1793–94), in its gloom recalls that darkened period of Wordsworth's life : but in the *Nay, Traveller*, (1795), we see already his exquisite inimitable touch in painting character and landscape. Wordsworth's single tragedy, *The Borderers*, follows. Action and variety are here too much suppressed in favour of analysis, as in other well-known instances of a poet's unpractised attempt in what is really another art than his own.

II. The four volumes of *Ballads and Poems*, between 1798–1800 and 1807, with the *Prelude*, form unquestionably the most important, the most charming body of Wordsworth's work. Among these are many poems in which admirable simplicity of feeling is joined to the happiest language and metre :—poems which, in their noble plainness deserve the fine praise of Matthew Arnold; 'Nature herself seems to take the pen out of his hand, and to write for him with her own bare, sheer, penetrating power.' Such are the simple tales from lowly life, pathetic or meditative, (*Ruth*, *Lucy Gray*, the *Reaper*, the *Highland Girl*) : tender love-poems, (*Three years*, *A slumber*, *She was a phantom of delight*) : narratives or meditations in his very highest and purest manner, (*Tintern*, *The Brothers*, *Michael*) : the lovely series of bird-pictures : many sonnets supreme in our sonnet-literature : ending with the *Ode on Immortality*, which a just judgment places also supreme among our reflective lyrics. The true balance between substance and art is here dominant : very few are the poems faulty from over-rusticity or over-elaborate language.

III. The *Excursion*, (1814), wherein the didactic element asserts itself too freely; the *White Doe*, (1815), idealism pure and exquisite in itself, yet, we must hold, pushed too far; two Odes on the Peace, somewhat overstrained and unlyrical, may open this stage of Wordsworth's mature life. But presently the poet, perhaps induced by the education which he was giving to his eldest son, broke new ground in the *Laodamia*, *Dion*, *Trajan's Pillar :* poems which have a unique character from the high spiritualism of their treatment. And with these may be joined the six odes to *Lycoris*, *September* and *May :* lovely at once in sunset glow, calm depth of feeling, and metrical skill. Here too fall the *Duddon* sonnets, Wordsworth's latest important study of the soul of landscape.

IV. The *Ecclesiastical Sonnets*, a singular monument of skilful historical narrative in that difficult form, though dating from 1820, may lead us to the poems of Wordsworth's genial old age. Here, whilst a serener pensiveness, a larger scope, is shown, and earlier faults of style avoided, we feel that the subjects are often less vividly conceived and handled. Yet here also not a few short pieces occur, even to the poet's last years, so felicitous in thought and rendering as to show that the mighty hand had not lost its ancient cunning.

The complete works, with Life, Dorothy's Journals, and Letters, were edited by Professor Knight (16 vols. 1897 *et seq.*). The chief editions of the poems are the author's editions published by Moxon (6 vols. 1836–37, and 1849–50; 1 vol. 1845), the library edition by Knight (8 vols. 1882–86), that by Lord Morley (1 vol. 1888), and the Aldine edition by Professor Dowden (7 vols. 1893). Among selections are those of F. T. Palgrave (1865), Matthew Arnold (1879), and the Wordsworth Society (ed. Knight, 1888). The prose works were collected by Dr A. B. Grosart (3 vols. 1876). The chief Lives are by his nephew [Bishop] Christopher Wordsworth (2 vols. 1851), F. W. H. Myers (1880); J. M. Sutherland (1887), Elizabeth Wordsworth (1891), Knight (3 vols. 1889), and Harper (1916; q.v. for the first statement of the Vallon episode). The most important criticisms are those of Coleridge, De Quincey, George Brimley, Sir H. Taylor, Bagehot, Clough, M. Arnold, Stopford Brooke, Lowell, Masson, Professor Dowden, R. H. Hutton, Shairp, Aubrey de Vere, Sir Leslie Stephen, Dean Church, Swinburne, and Sir Walter Raleigh (1903). The Wordworth's Society's Proceedings were issued in 1880–88, the *Wordsworthiana* in 1889. See also De Quincey's *Recollections of Lake Poets*, J. S. Cottle's *Early Recollections of Coleridge* (2 vols. 1837), *Memorials of Coleorton* (2 vols. 1887), H. Crabb Robinson's

Diary and *Correspondence* (selections by Edith Morley, 1922, 1927), Dorothy Wordsworth's Journals (1897), and *Dorothy Wordsworth*, by Edmund Lee (1894); Professor Knight's *Through the Wordsworth Country* (1887), *The Lake District* (1878), and his edition of prose works (1897); Émile Legouis, *La Jeunesse de William Wordsworth*, tracing the marked influence of William Godwin (1896, trans. 1897, new ed. 1921) and his *William Wordsworth and Annette Vallon* (1922); studies by Garrod (1923) and Beatty (1923); and the articles COLERIDGE, SOUTHEY, WILSON (JOHN), and LAKE DISTRICT.

Work. See DYNAMICS, ENERGY, FORCE, HORSE-POWER.

Work, HENRY CLAY, song-writer (1832–84), born at Middletown, Connecticut, attracted notice during the American civil war by his war-songs, of which 'Marching through Georgia' is best known. Of nearly a hundred songs of his the most popular were 'Lily Dale' and 'My Grandfather's Clock.'

Workhouse. See POOR-LAWS.

Workington, a municipal borough and seaport of Cumberland, at the mouth of the Derwent, 7 miles N. of Whitehaven by rail. Its harbour is safe and commodious, the new dock being an important work. To the coal-mines in the vicinity the town chiefly owes its prosperity; and there are engineering works, large iron works and steel rolling mills and foundries. A technical college was opened in 1913. On her flight from Langside in 1568, Mary, Queen of Scots, landed at Workington, already the chief haven in Cumberland, and was entertained at Workington Hall. Workington was incorporated as a municipal borough in 1888, and was extended in 1899 so as to include Seaton Ward, a populous district on the north side of the Derwent. Pop. (1881) 14,109; (1921) 26,480.

Workmen. See COMPENSATION, FACTORY ACTS, MASTER AND SERVANT, TRADE UNIONS.

Works, BOARD OF. In 1806 the management and control of public works and buildings, of which the expenses are defrayed from the crown revenues or parliamentary grants, were entrusted to an officer called the Surveyor of His Majesty's Works and Public Buildings. In 1832 the duties of this officer were transferred to the Commissioners of Woods, Forests, and Land Revenues (see WOODS AND FORESTS); but this arrangement eventually resulted in a complaint that the crown revenue was applied too easily to the execution of public works and improvements, and that parliament was unable to exercise proper control. The department of Public Works was therefore again separated, in 1851, from that of the Woods and Forests, and placed under the management of a new Board, called the Board of Works and Public Buildings, composed of a First Commissioner, who is a political officer, and sometimes has a seat in the cabinet, together with the Secretaries of State, and the President and the Vice-president of the Board of Trade, who are *ex-officio* commissioners In addition to the control over public works and buildings possessed by the former united Board, the Board of Works took over the management of certain parks (including Richmond, Greenwich, Bushy, Phœnix, and Holyrood Parks), and public gardens (such as Kew and Hampton Court). The Board has some responsibilities in connection with the national buildings and collections and ancient monuments. The Board of Works is under control of the Treasury, to whose sanction all large estimates for public works must be submitted. The Treasury appoint the secretary, clerks, and other officers of the establishment; and with the sanction of the Treasury the Commissioners appoint or employ such architects, surveyors, &c. as may be necessary. The Metropolitan Board of Works was founded in 1855, with very extensive and various powers as to London (sewerage, fire brigades, gas and water supply, Thames Embankment, bridges, ferries, tunnels, subways, street improvements, supervision of buildings, artizans' dwellings, tramways, music halls, &c.); but the London County Council took over in 1889 its innumerable duties, and the Metropolitan Board of Works ceased to exist.

Workshop Acts. See FACTORY ACTS.

Worksop, a town of Nottinghamshire, on the river Ryton and the Chesterfield Canal, 16 miles ESE. of Sheffield and 23 N. of Nottingham. It lies near the northern extremity of Sherwood Forest (q.v.), in a district known as the 'Dukeries,' from the number of ducal seats. There is Worksop Manor, in whose predecessor (destroyed by fire in 1761) Mary, Queen of Scots, was a prisoner under the Earl of Shrewsbury, and which, formerly a seat of the Duke of Norfolk, was purchased in 1840 by the Duke of Newcastle. His, too, is Clumber Park (q.v.); and there are also Welbeck Abbey (q.v., Duke of Portland) and Thoresby Park (till 1773 Duke of Kingston, now Earl Manvers). Worksop church was that of an Augustinian priory (1103), of which there is also a Decorated gateway, but a Norman keep has vanished. Modern buildings are the Town Hall (1854), Venetian in style, and the Mechanics' Institute (1852). Coal-mining is the chief industry, with malting, brass and iron founding, and manufactures of chemicals, agricultural implements, &c. Pop. (1851) 7058; (1921) 23,198.

World in the widest sense means the universe, the whole system of created things (as contradistinguished from God). In this sense the world, and facts and problems in regard to it, are discussed at ASTRONOMY and other articles cited there (such as SOLAR SYSTEM, STARS, COMETS, ETHER, &c.), CREATION, COSMOGONY, DARWINIAN THEORY, RELATIVITY, and in many of the articles on philosophical and theological systems, such as PANTHEISM, NEOPLATONISM, &c. In the narrower sense it means the terraqueous globe, discussed in its physiographical relations in the article EARTH, where are described its figure, dimensions, mass, mean density and constitution, its surface, movements, the distribution and work of solar energy. The areas in detail of the great land-divisions of the world will be found under CONTINENTS. The population of the earth is estimated as follows:

Europe	476,000,000
Asia	921,000,000
Africa	142,000,000
America (North)	136,000,000
America (South)	64,000,000
Australasia	9,000,000
Total	1,748,000,000

The following table shows approximately the numbers professing the chief faiths of the world:

Buddhists	135,161,000
Hindus	210,400,000
Mohammedans	219,030,000
Confucians	301,155,000
Shintoists	20,512,000
Jews	15,580,000
Christians—	
Roman Catholics	273,500,000
Orthodox	121,801,000
Other Christians	170,900,000
Various Heathens	152,625,000
	1,620,664,000

See also the articles CHRONOLOGY, ETHNOGRAPHY, GEOGRAPHY, GEOGRAPHICAL DISTRIBUTION, GEOLOGY, MAN (for the antiquity of the human race).

World War. The diplomatic situation in 1914 was marked by three major enmities, linked up by alliance and entente: (1) The **Franco-German,** ancient but heightened after 1871 by the increased strength of a united German Empire and by the

forced French retrocession of Alsace-Lorraine under the Treaty of Frankfort, a retrocession which few Frenchmen regarded as permanent. It had been further sharpened by Bismarckian threats of preventative war and later by successive crises caused by German efforts—provocative in method, however justified in basis—to prevent the French assuming a protectorate over Morocco without arranging with Germany some compensation for her lost expectations there, as they had done with England and Italy. In 1911 Germany had received her compensation, but the tension and resulting armament-race remained on both sides.

(2) The **Austro-Russian**, also ancient but specially acute since 1908. Russia had encouraged the Balkan Slavs to build up their national states at Turkey's expense, and was now encouraging Serbia with hopes of the early annexation of the South Slav areas of Austria and Hungary. Russia was herself meditating the forcible acquisition of control of Constantinople and the Straits in the course of a general European war. On the other side, Austria-Hungary, alarmed at the growth of Serbia and the rapid progress of the movement towards South Slav unity, in 1908 annexed Bosnia and Herzegovina, which she had occupied under the Berlin Treaty since 1878. At the end of the resulting crisis she received Serbian promises to check the agitation for expansion northwards at her expense, promises by no means kept, and meanwhile in Bosnia she dealt severely with South Slav propaganda while doing little to remedy the very real grievances of her Slavic subjects. Germany also, stepping into the rôle of patron of Turkey left vacant by Anglo-Turkish quarrels over Armenia and Egypt, had since 1897 been rapidly proceeding with the economic penetration of the Ottoman Empire, a work symbolised by the Berlin-Baghdād railway with its planned extension to Basra. Thus in the Balkans Russia was supporting Serbia in aims which Austria must repel or collapse; while Germany was strengthening Turkey and building up a system from North Sea to Persian Gulf, which at Constantinople was incompatible with Russian aims, and at the eastern terminus conflicted with British and Russian interests, and might threaten the communications with India. The Franco-German and the Austro-Russian enmities were linked up by the Austro-German Alliance of 1879, the Austro-German-Italian Triple Alliance of 1882, and the Franco-Russian Alliance completed in 1893—all technically defensive.

(3) The **Anglo-German** of relatively recent date. Till 1894 England had co-operated with Germany, and a definite alliance had been often in sight. From 1895 to 1905 Germany, supporting Russia in the Far East and relieved meanwhile of risks of Austro-Russian clash in the Balkans, had been cavalier in her treatment of England, and in particular suspicious and unreasonable in her reception of the Chamberlain alliance suggestions of 1898–1902. England, having narrowly escaped a hostile European coalition during the second Boer War, and with France and Russia still intensely hostile, found isolation no longer splendid, and, failing to win Germany, turned eventually to Japan, France, and Russia. The next Anglo-German rapprochement found England somewhat committed to the opposing combination, while between England and Germany the new difficulty of naval competition was proving insuperable. Only in 1905 did the Tangier crisis bring the prospect of Anglo-German hostilities at all near and call attention to the growing German fleet. Next year the launching of the first Dreadnought, soon imitated by Germany, made the competition more serious, since naval superiority was soon counted in these alone, and England had lost some of her long lead. British efforts at agreed reduction of naval programmes, though supported by example, met with little German sympathy, and by 1909 the race had become headlong. Genuine efforts to reach a settlement failed through inability to agree on the fixed ratio of battleships and British refusal of the German counter-demand for binding diplomatic commitments which would weaken the Entente. The Anglo-German and Franco-German enmities had been linked since 1905, when the originally colourless Anglo-French Entente of 1904 began to develop into a habit of co-operation, thanks mainly to the crises over Morocco, where England, in return for a free hand in Egypt, was bound by secret clauses to support France against all comers. Plans for military co-operation from 1906, and naval from 1912, with a background of steady diplomatic co-operation in all parts of the world, turned the Entente into a moral alliance; for, though England's hands were nominally free, the defence, at least in early stages of a German war, of the non-Mediterranean French coast and the northern frontier was virtually entrusted to England in the plans of the staff. The Anglo-German and Austro-Russian enmities were linked by the Anglo-Russian Entente of 1907, ensuring co-operation against Germany in Mesopotamia and Persia, but never achieving complete understanding on the Near East. The outbreak of the war just anticipated the completion of naval agreements with Russia analogous to those with France.

Italy had for a dozen years been an unsatisfactory member of the Triple Alliance, despite its formal renewals. Repeated diplomatic bargains with the Entente Powers to secure Tripoli, and the hardly veiled desire to complete Italian unity at Austrian expense, made her attitude completely uncertain. The same was true of Rumania, despite thirty years of adhesion to the Triple Alliance. She too had her largest 'terra irredenta' within the polyglot Hapsburg empire. Turkey's decision, in view of twenty years of German friendship and the known designs of Russia, was less doubtful. Thus France and Russia and Serbia, with England and her ally Japan less certainly adherent, confronted Germany, Austria, and Turkey, with Italy and Rumania linked by treaty, but in practice unreliable. The risk of conflict was increased by the existence in both camps of states wherein there was little democratic control of policy, while military and naval 'General Staffs' exerted only too much influence.

The risk that these great opposing diplomatic combinations might turn any local conflict into a world war was realised, and the moral had been enforced by the near approach of that catastrophe during Moroccan and Balkan crises. Efforts to reduce the rigidity of this division into rival camps were made on both sides, but suspicion of the enemy and fear of desertion of friends were serious checks. In particular, Sir Edward Grey, in the last years of peace, attempted to prevent the recurring emergence of the hostile groups at every crisis by a real revival of the 'Concert of Europe,' and by its means helped greatly to isolate the dangerous Balkan wars, being loyally supported by Germany. But though the Morocco and the Baghdād railway difficulties were settled before the war, the naval rivalry remained, since England dare not move away from the Entente while Germany maintained her bid for naval power, and Germany dare not cease building while surrounded by a solid ring of powers linked by alliance and entente. Also, the Austro-Russian enmity remained. While on the one hand Russia meditated a forward policy in the Balkans, and had been given a dangerously free hand by the France of Poincaré; on the other hand the Hapsburg government knew it was fighting for its life, meditated preventative war, and knew that,

whatever it did, Germany, with no other dependable ally, was bound to support it or risk complete isolation. And it was from this Austro-Russian enmity that the Great War immediately arose.

The Outbreak.—From the Balkan Wars (1912–13) Serbia emerged with greatly enlarged territory, increased hopes of soon completing South Slav unity at Austria's expense, and a new grievance against Austria, as chiefly responsible for barring her at the peace conference from access to the Adriatic. The military party, members of which were closely linked with the terrorist secret society, 'Union or Death,' led the agitation, and it was doubtful whether the civil government had strength to check their activities. Moreover, the civil government itself had, since 1909, been discussing with Russia the forcible creation of Yugoslavia, so soon as Russia was ready. In Bosnia, and other Slavonic provinces of Austria-Hungary, revolutionary societies were working for freedom from the Hapsburgs, with or without union with Serbia.

On June 28, 1914, the Archduke Franz Ferdinand, heir to the Hapsburg throne, was murdered at army manœuvres at Sarajevo. The murderers were Bosnian Slavs, but the plot had been assisted by senior Serbian officers—members of 'Union or Death'—and was almost certainly known to members of the Serbian government, who took no adequate steps to stop it or give warning. (This was not proved until 1924.) Austria at once attempted to trace the crime to the Serbian government, but before the commission of inquiry had reported, finding no certain proof, she took her decision on grounds of the general attitude and known designs of Serbia, and the need to utilise a moment of European sympathy. She appealed to her ally, Germany (July 4), who, having refused unconditional support in three recent Austro-Serb crises, could hardly add a fourth refusal without imperilling her only sure alliance. To this appeal, and to the communication of Austrian draft proposals (10th), Germany simply replied, 'Austria must decide what measures are necessary.' But Germany knew the prevailing war spirit in Vienna, and herself judged Serbia's acceptance of the draft proposals impossible. So that these indifferent replies were really a sanctioning of Austro-Serb war, and it was with this knowledge that Germany had (6th) pledged faithfulness to her alliance obligations in case of Russian attack. But the chances of such a generalising of an Austro-Serb conflict were rated higher at Vienna than at Berlin, where there was too great reliance on the known incomplete preparedness of Russia and the recent improvement in Anglo-German relations. Germany accordingly did nothing as yet to prepare for war.

Austria still delayed her action, thanks to hopes of proving Serb complicity, and to the difficulty of winning over Tisza, the Hungarian premier, to the policy of sending Serbia an unacceptable ultimatum. His consent once secured (17th), the ultimatum was despatched to Belgrade for delivery on the 23rd, with instructions to break off relations in forty-eight hours on receipt of any reply short of complete acceptance. This short time-limit was intended to secure a *fait accompli* before the Entente Powers could concert intervention. Actually, coming after three weeks' silent delay, it did much to estrange European sympathy from Austria, and to make, not intervention, but mediation, difficult. The harshest demand in the ultimatum was for Austrian co-operation in the Serbian inquiry into the Sarajevo plot, and in the suppression of irredentism; and though nothing short of this was likely to be effective, Austria had undoubtedly secured in it the 'impossible concession' she desired, in order to ensure rejection. The text of the ultimatum was known in Berlin only on the 22d, and its tone—or its probable effect on European opinion—caused some consternation. Russia had been uneasy at Austria's long silence, and Poincaré, the French premier, during his visit to the Russian Court (20–23), agreed that France and Russia would not suffer the humiliation of Serbia. On sight of the actual ultimatum, the Russian foreign minister, Sasonov, at once held that Austria intended war on Serbia, and that Russia could not desert her protégé. For this view he secured promise of full support from France, but not from England, Sir Edward Grey at present holding that England had no concern with an *Austro-Serb* quarrel, but that, if necessary, England should join with France, Germany, and Italy to mediate between *Austria and Russia*—a proposal accepted by Germany.

Meanwhile (25th) Russia ordered 'measures preliminary to mobilisation,' to be followed by mobilisation against Austria if she attacked Serbia. That same day also, Austria broke off relations with Serbia, and began a partial mobilisation against her, Serbia's acceptance of the ultimatum demands having been highly conciliatory, but not complete. Grey now (26th) proposed a conference of the great European powers on the *Austro-Serb* quarrel, thus coming into line with France and Russia. This proposal Germany rejected, fearing that the Powers would act on lines of alliance rather than of justice, and that with Austria eliminated (as a party to the dispute), and Italy uncertain, she would be in a hopeless minority against England, France, and Russia. Therein she certainly underestimated Grey's will to peace, and forgot his fairness during the London conference in 1913 on the Balkan crises. Her refusal was tempered by information that Austria was beginning direct negotiations with Russia—which all agreed would be preferable. But Austria intended in the negotiations only to offer guaranteed limitation of her action in Serbia, Russia to revise the now-expired Austrian ultimatum, so that discussion proved fruitless.

German refusal of a conference, and the receipt, too long delayed, of Serbia's reply to the Austrian ultimatum, brought Grey (27th) nearer the Russian standpoint; yet, in view of cabinet feeling, he had to combine stringent warnings to Germany and Austria with refusal to guarantee support to Russia. Though unprepared for immediate military action, and aware of German disapproval, Austria now (28th) madly declared war on Serbia, making withdrawal or further negotiation difficult. This action caused her to refuse (as too late) urgent German demands that she should negotiate on the basis of the Serbian reply, demands which receipt of the text of the reply, combined with news of Grey's warnings, had elicited from Berlin, and it ended the direct Austro-Russian negotiations, which Austria would only continue concurrently with military action against Serbia. Germany now attempted to secure Austrian guarantees to limit that action to temporary occupation of Belgrade, as a 'pledge,' pending Anglo-German mediation.

Meanwhile Russian 'measures preparatory to mobilisation' evoked (29th) stringent warnings from Berlin, accompanied by news of Germany's conciliatory pressure on Austria. Russia, however, in view of the Austrian declaration of war on Serbia, ordered (29th, morning) general mobilisation—soon (evening) temporarily modified to partial mobilisation against Austria only, and wired Paris and London that war was inevitable. Grey had this day again proposed mediation by the four Powers, between Austria and Serbia, on the basis of Serb promises of further concessions, Austria meanwhile to limit her military action to Belgrade. These proposals Berlin, influenced

by Grey's new declaration that England would not remain neutral as between France and Germany, repeatedly urged on Austria, going to the point of threatening to desert her. But Vienna remained silent, having, like Russia, apparently decided that war was inevitable, and that Germany dare not ultimately fulfil her threat of desertion.

On July 30 the Tsar was reluctantly induced by the military party to substitute general for partial mobilisation (i.e. to mobilise also against Germany). This in view of existing conventions, the terms of the alliances, and German warnings, must be understood as making *general* war virtually inevitable; and negotiations subsequent to its being known, were attempts to gain time, or divert responsibility, rather than hopeful peace efforts—a criticism specially applicable to the renewed direct Austro-Russian negotiations. Meanwhile, Vienna still delayed official response to the proposals forwarded by and through Berlin, and unofficial indications were unfavourable. Finally, on the 31st, an Austrian Crown Council reached decisions involving virtual rejection of the proposals. Knowledge of this attitude reached Berlin simultaneously with confirmation of the Russian mobilisation against Germany, which removed any chance of Germany deserting Austria for her intransigeance. Germany proclaimed 'Drohendes Kriegsgefahr' (state immediately preparatory to mobilisation), and warned Russia that full mobilisation and inevitable war would follow in twenty-four hours, if she did not countermand her mobilisation. The problem of France's attitude now became vital, since, whilst under the Franco-Russian alliance France was bound to fight with Russia, she might, by temporary postponement of action, ruin the rigid German war plan, under which France must be dealt with first. Accordingly a clear declaration of war or neutrality was demanded of France and cleverly evaded. George V.'s appeal to the Tsar failed, through arriving *after* the German ultimatum to Russia, and Grey's last attempt (August 1) to settle the Austro-Serb question reached Germany only after her declaration of war on Russia. A last apparent Austrian concession was passed on to Russia also too late. For now the crux was not Serbia, but Russia's refusal to reply to German demands for cessation of her mobilisation, resulting in Germany ordering general mobilisation, followed by a needless and foolish formal declaration of war (evening of August 1). Though France had evaded German demands for a declaration, she had ordered full mobilisation simultaneously with, and prior to news of, the German mobilisation. The German General Staff vetoed, on technical grounds, a diversion of mobilisation from the French frontier, to meet a supposed British willingness to guarantee French neutrality; and it remained for Germany again to put herself in the wrong by formal declaration of war on France (3rd). Austria declared war on Russia only on the 6th.

Meanwhile Grey's position had become difficult. Till August 2 he had failed to get Cabinet consent for assurances to France of naval protection against Germany, in accordance with the agreements of 1912, and Churchill to get sanctions for a full naval mobilisation, already ordered, but both were sanctioned that day. Next day Grey, backed at last by the Cabinet majority, had to explain to Parliament the 'obligation of honour' to France, which had been accumulating without its knowledge. But before the evening session, the situation was transformed, and unity restored to the Cabinet, Parliament, and nation by news that Germany, in pursuance of long-determined strategic plans, had sent to Belgium an ultimatum, demanding passage through her territory, despite repeated guarantees of its neutrality by the European Powers. A British ultimatum demanding withdrawal from Belgium reached Germany on August 4, and expired without reply at midnight.

1914. Naval.—Three of the most vital factors in the war were naval: (1) The overwhelming superiority of the Allies on the high seas—roughly 8 to 3 after Italy's adhesion—ensured their own communications and supply and the success of the blockade, the most important single factor in their ultimate victory. (2) The naval superiority of the Central Powers in the Baltic and Black Sea confirmed the isolation of Russia, a main cause of that collapse which almost gave victory to the enemy. (3) The reckless submarine campaign, to which Germany was driven by naval inferiority and blockade, came near starving England, but also threw the decisive weight of America into the allied scale.

The Allies' strategic problem was to close the seas to the enemy and maintain transport and supply to widely scattered fronts, and yet to retain in the North Sea forces sufficient to master on occasion the idle but concentrated German fleet. Germany's problem was by concentrated sallies against forces necessarily divided, and, by use of mine and submarine, to wear down the allied naval superiority till a general engagement could be more than a desperate throw. And on both sides the cost of the modern battleship and its vulnerability to mine and submarine imposed a caution which left fighting to smaller craft, and often kept the British battle-fleet as safely interned at Scapa as the German at Kiel.

Thanks to Churchill, all sections of the British fleet were fully mobilised at war stations 36 hours before the declaration of war, the Grand Fleet at Scapa, the remaining North Sea forces at Rosyth, Harwich, and Dover. The only North Sea battle of 1914 was fought off HELIGOLAND (Aug. 28), when Tyrwhitt's destroyers and Beatty's cruisers cheaply destroyed three German light cruisers. In November the attempt was begun to prevent neutral supplies reaching Germany by limiting North Sea traffic by mine-fields to definite channels where suspect vessels could be intercepted and searched. But the impossibility of a technical 'blockade' and the antiquated contraband list of existing International Law from the first presented Britain with the old alternative of foregoing the chief advantage of naval supremacy or risking the legally justified displeasure of neutrals. Squadrons engaged in the blockade were also necessarily exposed to danger from mine and submarine, and four British cruisers and a Dreadnought were sunk this year. Germany, though previously unprepared, had quickly seen the suitability of submarine action for her special situation, and begun rapid construction.

In the Mediterranean the chief event was the escape (Aug. 2–11) of two isolated German cruisers, *Goeben* and *Breslau*, to Constantinople, where, under colour of transfer to Turkey, they remained till, on Turkey's formal belligerency, they could play their part in the mastery of the Black Sea. The Austrian navy and merchant fleet were from the first blockaded within the Adriatic by a French squadron at its mouth, a fact whose importance increased when Italy joined the Allies.

The German Far Eastern squadron, five cruisers under von Spee, sought to return by Cape Horn. At CORONEL they encountered four British cruisers under Craddock, whose reinforcement had been regrettably delayed, and through superior marksmanship and advantage of light sank two of them (Nov. 1). Sturdee's much stronger avenging squadron settled accounts with von Spee off the FALKLAND ISLANDS (Dec. 8). German merchant-

cruisers, notably the *Emden*, *Karlsruhe*, and *Königsberg*, sank some seventy merchant-ships before they were accounted for in November.

1914, Western Front.—For Germany the governing considerations were the necessity of fighting on two fronts and the certainty of a serious numerical inferiority almost from the first, which was bound to increase as the war continued. Knowledge of the slowness of Russian mobilisation, and of the difficulty of quickly inflicting on Russia a really decisive defeat owing to her size and poor communications, led obviously to a policy of seeking first an early decision in the West, while merely holding or even giving ground in the East. Again, the need for speed, the difficulties from geographical position and railway connections of an attack launched from SW. Germany, and the certainty of delay in face of the French defences from Verdun to Belfort, formed strong inducements to make the main attack north of the Ardennes, even at the cost of violating the neutrality of Belgium, which Prussia had joined the other Powers to guarantee. Against this had to be weighed the chances of England's neutrality if Belgium were not touched, and these there was no reason to reckon high. Moltke and the German General Staff therefore adhered to the 'Schlieffen' plan of a rapid wheeling advance through Belgium, pivoting on Metz, but modified it in two ways. Dutch Maastricht was not touched, causing serious constriction and delay in passing between it and the Ardennes; secondly, rather than risk the temporary loss of Alsace-Lorraine, eight corps were detached for service there, mainly to guard the gap in the German fortifications between Metz and Strasburg—a force so strong that it was tempted to help the envelopment of the French army by an advance across the upper Meuse, through the corresponding gap in the French defences between Toul and Épinal. They failed in this, and the bulk of these corps were hurried westwards, arriving too late for the Marne battle, where their presence might have turned the scale.

The French aim—Joffre's plan 17 of 1913—was to concentrate all early available forces for a double attack on Lorraine, north and south of the Verdun-Toul defences. Though often warned of the risk involved in this plan, Joffre concentrated all his forces south of Mézières, leaving the Belgian frontier unguarded save for a cavalry corps, some reserve divisions, and the small British force under Sir John French. Apparently Joffre counted that the modern fortresses of Liége and Namur would delay a German advance through Belgium sufficiently for him to secure a rapid decision in Lorraine before turning northwards. The sentimental call of Alsace-Lorraine had weight, as also had the French preference for a strategy of attack, which would have been hampered by an initial concentration on the Belgian frontier. Owing to the German concentration of four-fifths of their forces on the Western Front, and to their quicker mobilisation, Germany faced France at the beginning with 1·5 against 1·3 millions, but two months later they stood at 1·7 against 2·3 millions, of whom 200,000 were British and Belgians.

German mobilisation was not complete till August 14, but the advance began on the 4th, the day after the Belgian rejection of German demands for free passage. The first objective was Liége. Its eastern forts were soon destroyed, and on the 7th the German advance-guard could pass through to meet the Belgian field-army near Tirlemont (11). The main force joined them (16), and three days later the Belgians fell back upon Antwerp, leaving v. Kluck and the German right to occupy Brussels (20), while Bülow turned to reduce Namur. Though some forts here held out till the 27th, the city and the bridges were in German hands five days earlier. Meanwhile the armies of the German centre, penetrating the Ardennes, had reached Dinant and Neufchâteau. The first advance through Belgium was undoubtedly marked by atrocities and systematic destruction, though contemporary accounts were gravely exaggerated. Spasmodic shooting by Belgian franc-tireurs was the excuse, the desire to terrorise Belgium out of resistance, and to ensure the quick surrender of towns without street-fighting was the more weighty reason.

Only on the 12th did Joffre recognise the German plans; the Fifth French Army was sent up towards Namur, the Third and Fourth to hold the Ardennes against the German centre. Yet Joffre retained his plan for an offensive south and north of Metz. The former (Aug. 14–21) after initial success was forced back on the Meurthe, bringing back with it the 'Army of Alsace,' which had made a successful push towards Mulhouse; the latter (20–22) also after early successes ended in retreat to the Meuse, leaving Verdun exposed and the Briey basin in German hands. The French Fifth Army, reaching the Sambre, suffered relatively the heaviest casualties of the whole war in the battle of CHARLEROI (20–22). In any case, its position in the Sambre-Meuse angle became untenable, since Namur had fallen and the German centre was threatening its rear from Dinant, so that on the 23rd it began to fall back. That same day the British had reached their deployment-line Condé-Mons-Binche, only to find Namur fallen, the French retreating, and themselves outnumbered and outflanked. Thus began the **Retreat from Mons**, accompanied by heavy rearguard actions, as at LANDRECIES and LE CATEAU (25). The whole Allied line was now in rapid retreat, pivoting on Verdun. The Germans, intent on their major plan, let slip frequent opportunities of thrusting through the gaps between the Allied armies, and neglected also to occupy Western Belgium and the Channel Ports, though the British force was virtually cut off by the retreat itself from all its bases except Havre. On the night of the 28th, after five days' continuous marching and fighting, the British secured a night's respite on the Oise, thanks to a French success at Guise. But with v. Kluck's forces stretching out westward beyond Amiens, the risk of outflanking was very great. The retreat had to continue, but the hinge at Verdun held, and a further retreat to the Marne would give to the Paris garrison and the new Sixth Army in formation north of Paris a chance to turn the danger of the Allied left into a chance of outflanking the German right under v. Kluck. On the 31st the line stood on the Aisne-the Vesle-Reims-Verdun, but the troops, especially on the left, seemed completely exhausted. The French government left their threatened capital for Bordeaux, entrusting its defence to Galliéni, with control of Manoury's new Sixth Army near by. The German Supreme Command in Luxemburg, ignorant of the growing strength of Manoury and thinking the British incapable of resistance, ordered Kluck (Sept. 2) to wheel the German right on to the left flank of the Fifth French Army. Joffre, in view of this danger, had resolved to retreat further, and the Germans crossed the MARNE in force (3). Next day German Head Quarters, discovering Manoury's growing strength, countermanded the order to Kluck. But orders from Luxemburg had been habitually so late and so irrelevant that Kluck, ignoring Manoury and disobeying the counter-order, pushed on south-eastward. Galliéni saw the opportunity and ordered Manoury to attack Kluck's rearguard, on news of which Joffre ordered the whole line to hold and counter-attack on the 6th. Manoury's attack on

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the Ourcq forced Kluck to retire his main force, leaving the Allied left to push back to the Marne (9). Manoury, faced with all Kluck's army, was himself in peril, but was reinforced, and Kluck, to avoid encirclement, had to fall back (9) on Épernay, as did Bülow on his left. Meanwhile Foch's Ninth Army had borne the brunt of a determined attempt to break the French centre. It almost succeeded (9), but in a desperate counter-attack Foch found the gap created between the German right and centre by the retreat of the right, and thrust through. To save itself the German centre had now also to retreat, permitting the French to re-cross the Marne (11).

Simultaneously with the Marne battle the French had to meet a double onslaught on Verdun from the NW., where the Crown Prince was eventually thrown back on the Argonne, and from the SE. where massed attacks on the Côtes de Meuse were repulsed. But on the 24th the Germans broke through to St Mihiel, and though securing no considerable foothold across the Meuse, maintained this strange salient till 1918, thus gripping Verdun on three sides. Further south a double threat on the Toul-Épinal gap had been foiled, the one by the holding of the Grand Couronné de Nancy against expensive frontal assaults (Sept. 1–11), the other by heavy fighting in the Vosges (Aug. 25–Sept. 15).

After the Marne victory the Allies found the retreating Germans halted behind the Aisne, some crossings of which they secured (Sept. 13), but in three days of frontal attacks won no footing on the Chemin des Dames beyond. Thereafter, though, thanks to German counter-attacks, heavy fighting continued along the Aisne, the critical feature was the attempt of each side to outflank the other by successive extensions of their western wings into Picardy and Artois with troops brought up from Alsace-Lorraine. This extension transferred the focus of hostilities from Aisne to Somme (battle of ALBERT, Sept. 25–29) and later to Arras (Oct. 2–9). The out-flanking race then merged into the race for the Channel Ports. For this Foch was given the special command of the three northernmost French armies, while the British, who from an original flank position had by the additions to the French left become almost central, were (Oct. 2–19) transferred to a new flank position near Ypres. The supreme direction of the German effort was committed to Falkenhayn, who replaced Moltke after the Marne defeat.

Meanwhile the Belgians around Antwerp by frequent sorties retained a considerable German covering force which made no serious attack till September 28. Falkenhayn, however, having failed to retrieve the Marne disaster, turned to Antwerp and the Channel Ports. Though it was clearly important for the Allies to secure Antwerp as terminus for their extending line, it was only after three days' bombardment had crippled the outer defences that Kitchener urged on the French the necessity of a joint relief force. Promise of this induced the Belgians (Oct. 3) to postpone evacuation. Churchill arrived with naval divisions and promise of large reinforcements by the 7th. But next night (5) the Belgian line was broken and their retreat endangered. The field-army left (6), the garrison and British naval divisions remaining, but having themselves to escape with loss (8) as relief had not arrived. Rawlinson's relief corps was in time to enable the Belgians to establish themselves on the Yser (16), but Antwerp, Zeebrugge, and Ostend had fallen into German hands to become vital factors in the submarine campaign. So while the Belgian government and army escaped to reorganise, the veil fell over a Belgium almost wholly in German hands, doomed to share with Germany the results of the Allied blockade, and to share them as a conquered people with no rights as against the military necessities of the conqueror. Efforts were even made (Nov. 1916) to force civilians to work for Germany behind the Western Front. Attempts were also made by imposing German institutions and later by encouraging the Flamingant element against the Walloon, to prepare the way for permanent annexation.

The Belgian line reached south to Dixmude, the French north to La Bassée; between them Marshal French was arriving from the Aisne, Rawlinson's corps and French troops from Antwerp. Against this line Falkenhayn launched two armies in a determined attempt to reach the Channel Ports. They attacked the French at Arras (Oct. 21–26), the Belgians on the Yser (Oct. 17–Nov. 16) and the British as they gradually came into position at La Bassée, Givenchy, Neuve Chapelle, Ploegsteert Wood (Oct. 11–Nov. 8), and Ypres (Oct. 19–Nov. 17). The Belgians on the coast were helped by bombardments from British naval units; opposite their centre the Germans crossed the Yser, but the line was saved by the opening of the sluices which opposed a flood barrier as far south as Dixmude. This town the Germans won, but secured no firm footing across the river. The **First Battle of Ypres**, beginning with a Franco-British offensive, continued as a desperate defence of a line N. and S. of Ypres (Oct. 21–27) and ended in the defeat of the last attempt of 1914 to break through in the west (Oct. 29–Nov. 10) when the line E. and SE. of Ypres was twice broken and restored. French meditated evacuation, yet in the end the town was saved, though left subject to easy bombardment through the German capture of the commanding Messines-Wytschaete ridge. The battle ended in exhaustion and broken weather, and the last section of the Western Front was stabilised. Trench warfare was not the result of strategical foresight. Bad weather and exhaustion of men and munitions made continuous operations unprofitable. The situation on the Eastern Front demanded a diversion of Germany's striking force and a policy of quiescence in the West. The Allies were not unwilling, since every month meant increased prospects of British reinforcements. These were needed badly enough, for Allied casualties on the Western Front from August to December had exceeded a million—the bulk of them naturally French.

But the British meanwhile had done much to justify the voluntary system. The empire proved utterly loyal and eager for sacrifice; the first Canadian troops had landed in October. In England the violation of Belgium had united the country; propaganda, atrocity stories, and experience of air and coastal raids assisted. Above all, the magic name of Kitchener as War Secretary provoked trust and enthusiasm; and his early realisation of the war's probable length prevented any hurried and piecemeal squandering of half-trained units instead of the steady massing and training of the 'New Army.' Only slowly was it realised that his unwillingness to envisage new tactical methods, especially in the use of heavy artillery, and his tendency to undue concentration of the control of field operations within the War Office, and of the War Office on himself, were heavily discounting the advantages of his great prestige.

In Germany after a first outbreak against Russia, whom all believed to have forced the war on the Fatherland, patriotic anger centred on England, whose immediate support of France came as a bitter surprise to the uninitiated. The violation of Belgium was universally condoned, by some as a distressing necessity, by others as justified by the discovery of records of semi-official Anglo-

Belgian military conversations regarding joint defence against Germany, and England's attitude to the violation was considered purely hypocritical. Atrocity stories, as lurid as those circulated on the other side, increased German indignation and occasioned an early brutality to prisoners of war which was never general, but confined to certain camps and certain critical periods.

Christmas 1914 saw the first Zeppelin raid on England. Any demoralising effect of this form of 'frightfulness' was counterbalanced by its stimulus of the fighting-spirit. But Germany was successful in her main aim, to provoke outcry for protection, which was ultimately to keep hundreds of British airmen from the battlefields to defend civilians at home. Successful defences were improvised successively against the Zeppelin night-raids (1916), daylight aeroplane raids (1917), and night aeroplane raids (1918); but each phase of the attack first enjoyed a spell of immunity and success, and a total of some hundred raids caused 1400 deaths, four-fifths of them civilian. Paris also suffered badly, especially in 1918, when long-range bombardment was added to the dangers of multiplied air-raids.

1914. Eastern Front.—The main Russian effort was to be in Galicia, but to relieve the pressure on France a double attack was made on E. Prussia, where the German force was small. Rennenkampf attacking westwards north of the Masurian Lakes was to attract the main German force, which would then be taken in flank by Samsonov advancing west of the lakes. The German commander, beaten back by Rennenkampf, wished to evacuate the province but was replaced by the veteran Hindenburg, with Ludendorff as Chief of Staff. Hindenburg concentrating on Samsonov drove in his centre and outflanked both wings, capturing more than half of his forces (Battle of TANNENBERG, Aug. 26–31), Rennenkampf missed his chance of falling on Hindenburg's rear during the battle or while he reorganised to meet him, and had to fall back fighting to the Niemen (Battle of the MASURIAN LAKES, Sept. 8–15). A week later the Germans reached that river, but without Hindenburg and Ludendorff, who had gone with all the best troops to form the new Ninth Army in Silesia. After fighting hard (Sept. 25–29) to secure the crossing, the remnant retired, suffering heavily in rearguard actions, through the forested country round Augustów (Oct. 1–9), and entrenched in the Masurian lakeland, which could be held securely with small forces.

Austria wasted half her forces on the attempt on Serbia, which could have waited. The rest struck north-eastward from Cracow into Poland, reaching Lublin (Aug. 17–Sept. 2). The Russians with their awkward Polish salient could afford to retire here if they could advance in Galicia, where they might cut the Austrian communications or seize the Carpathian passes. They won Lemberg (Sept. 1–3), and after further fighting at Gródek and Rawaruska crossed the San (14), took Jarosław and invested Przemyśl (24). Then seizing the passes, their cavalry raided Hungary till mid-October while their centre closed on the Galician capital Cracow, to defend which the Austrians had to leave their Polish conquests, while the Russians approached the Silesian frontier.

To save this Hindenburg organised a daring Austro-German attack on Warsaw. Even if Warsaw were not won he hoped the threat would draw from Galicia such Russian forces as would enable the Austrians to recover lost ground. The Russian counterplan was to allow the Germans to approach Warsaw, where their flank could be assailed by reserves massed north of the city. The German attack reached the Vistula (Oct. 3–14), but had to turn to meet the northern menace. This exposed their new right flank to the reinforcements pouring up from Galicia along the opposite bank. Thus the Germans were caught in the Warsaw angle and had to retire. The Austrian left had been caught crossing the Vistula at Jósefów and suffered heavily. Now trying—and failing—to return the trick, they allowed the Russians to cross at Dęblin, so that the German right flank was also threatened. Their retreat became hurried and only ceased on the Silesian frontier (Nov. 9). The Austrian right had made no great use of the draining of Russian troops from Galicia. Though Przemyśl was relieved and the Carpathian passes cleared, the German retreat carried back the Austrians, Przemyśl was reinvested, Hungary again invaded, and by the 13th Cracow was in greater peril than ever. Hindenburg, now Commander-in-Chief in the East, had called in vain for reinforcements during the Warsaw battle, but it was the renewed danger to Cracow and Silesia which decided Falkenhayn that after Ypres the main German effort must be turned eastward.

The Russians in their Polish counterstroke renewed pressure on E. Prussia from south and east, against a force still further drained to reinforce Hindenburg's new attack on Warsaw from Toruń, which in turn relieved E. Prussia. Hindenburg's thrust was against the right of the Russians marching to attack Cracow and Silesia; success would remove this threat and reopen the road to Warsaw. In the battle of ŁÓDŹ (Nov. 23–Dec. 6) Hindenburg, after almost surrounding the Russian right, himself with difficulty escaped envelopment. The Russians withdrew to a line 30 miles west of Warsaw, its centre guarded by the Bzura. The Germans tried in vain to cross this river (2d Battle of WARSAW, Dec. 7–26) till exhaustion brought temporary stabilisation on the line Mlawa-Rawa.

After an Austrian defeat in the suburbs (Dec. 10) Cracow had only just been saved by Hindenburg's advance and a simultaneous Hungarian drive across the Carpathians. Russian counter-attacks again secured the central passes (27), and the year ended in Galicia with a line Dunajec—S. of Passes—W. of the Bukowina.

1914. Near East.—Serb attempts on Bosnia (Aug.–Nov.) and Mitrovica (Sept.) achieved no great success, while three successive Austrian invasions of Serbia were repulsed: (1) Aug. 13–25 Battle of the Jadar. (2) Sept. 7–17. (3) A more formidable attack from north and west, which after early success was crushed at the 'Battle of the Ridges' (Dec. 3–13).

Failure to secure Russian reassurances had induced Turkey to sign an alliance with Germany (Aug. 2) though she was not to declare herself till ready. Till October Sir Edward Grey, hoping despite adverse indications to keep her neutral, prevented offers at Turkey's expense which might have won over Greece and Bulgaria. Bombardment of Russian ports (Oct. 29) first declared Turkey's decision and was followed by British bombardment of the Dardanelles and proclamation of a protectorate over Egypt. Turkey's declaration of war began new campaigns in (1) CAUCASUS, where a Russian advance on Erzerum was defeated at Koprukeui (Nov. 9–Dec. 17), and the Turkish return-thrust on Kars met disaster at Sarikamish (Dec. 25); (2) MESOPOTAMIA, where the British advanced up the Tigris to Kurna (Nov. 5–Dec. 9); (3) EGYPT, where a small Turkish raid on the Suez Canal was repulsed (Nov.), but preparations had to be made against a more serious attack.

1914. Outlying Fronts.—In Africa British forces secured Togoland (August) and the Cameroon coastland (Oct.). German raids from E. Africa on Rhodesia and the Uganda railway were repulsed,

but an Indian landing at Tanga failed (Nov.). The ports of German S.W. Africa were secured (Sept.), but from the interior Maritz raised a rebellion in conjunction with De Wet in the Orange State and Beyers west of Pretoria. All were crushed (Nov.–Dec.). England appealed to her Japanese ally only for naval co-operation in the Pacific and help in the provision of munitions. Japan, however, paid off an old score by the reduction of Tsingtao (Aug. 23–Nov. 7) and the occupation of the Marshall Archipelago, while British Dominion forces acquired all other German Pacific possessions (Sept.–Oct.).

1915.—The key to the campaigns of 1915 is (1) the German decision to risk holding the Western Front with minimum forces, while seeking a final decision in the East, where Russia was suffering from isolation, mismanagement, and munition shortage, and (2) the Allied indecision between a policy of costly attempts to break through the Western Front, and one of strategically-important sideshows against Germany's partners which would make better use of the Allied sea-supremacy.

In England interest centred on the gradual revelation of munition shortage, due to professional unwillingness to recognise the new scale of artillery-fire demanded by trench warfare, political unwillingness to divert and control private enterprise to ensure output on that new scale, and trade-union unwillingness to abandon the agreed standards and regulations of peace-time to meet the emergency. Drastic and unorthodox action by French and Repington overcame the first obstacle, at the cost of weakening Asquith's and Kitchener's position. This, added to Gallipoli failures, caused the construction of the Coalition Government (May 25) with Lloyd George at the new Ministry of Munitions, where he gradually overcame the other obstacles. By autumn, man-power shortage was more serious than munition-shortage. Lord Derby inaugurated (Oct. 11) the last appeal for voluntary service, under a scheme which regulated order of summons to the colours by the age, condition, and responsibilities, of the 'attested.' But on December 21st the government had to sanction the principle of Conscription, to avoid glaring inequalities of sacrifice and to meet the army's demands for men.

There was some peace-talk this year. Even in October 1914 German negotiations had begun through President Wilson. But though Germany would restore Belgium, she would not cede Alsace, and the Allied peace-conditions were now linked and mutually guaranteed. Colonel House's mission (Spring 1915) failed, since both English and Germans were then confident of victory. Thereafter German-American tension over submarines left mediation to Socialist congresses and the Pope. But while German Socialists were discussing 'peace without annexations,' the government kept silence on its war-aims, thanks to the old division between the anti-British party, with eyes on Belgian coast and colonial annexations, and the anti-Russian party aiming at early peace with England, annexation of Poland, and developments in Near and Middle East.

1915. Naval.—The only serious North-Sea action was on January 24th, when Beatty's and Tyrwhitt's squadrons met a strong German reconnaissance force off the DOGGER BANK and engaged it in a running fight back towards Heligoland, sinking one and damaging two German battle-cruisers, but failing to complete the coup through the confusion caused by the disablement of Beatty's flagship. Thereafter, despite Tirpitz's protests, still stricter inertia was imposed upon the German fleet, and the British had to search for opportunities of offensive action. Co-operation with a land-offensive on the Flemish coast was prevented by Joffre's determination to concentrate military efforts elsewhere; plans against Borkum or the German Baltic coast lapsed for lack of troops to exploit success; nothing remained but the Dardanelles expedition and the bombardment of the Flemish and Syrian coasts. In the Black Sea Russia had by December regained equality—too late to help in the Straits, though able to co-operate usefully with the Caucasus offensive. In the Baltic, German attempts to land, after successfully entering the Gulf of Riga (August), failed with heavy loss. But the main naval interest of 1915 centred on submarine and blockade. In January, Germany declared war on enemy shipping in British seas, to be prosecuted inevitably by submarines, and therefore without guarantee to safeguard life by adequate warning before sinking, and with no guarantee of the safety of neutral vessels in view of British use of neutral flags. This 'unrestricted submarine warfare' began February 18th and had by December accounted for 400 merchantmen. British counter-measures, indicator-nets, Q-boats, and the 'mosquito-fleet,' became gradually effective, but the reduction in the number of sinkings was due rather to restriction of the campaign to meet American protests. The sinking of the *Lusitania* (May 7) with loss of 120 American lives resulted, after long exchange of notes with President Wilson, in orders (Sept.) to submarines to sink no passenger boat without warning and to concentrate on the Mediterranean. Even here loss of American lives on the *Ancona* (Nov. 7) led to renewed controversy with Wilson. Allied retaliation in kind was naturally confined to the Black Sea and the Baltic, where, though lives were carefully safeguarded, Denmark and Sweden entered vigorous protest. Sweden in particular had to be handled carefully, as cultural and commercial links with Germany, and the old enmity and fear of Russian expansion, had in 1914 brought her very near the Central Powers.

American anger at German submarines was balanced by anger at the 'illegal' British blockade, strengthened from March onwards in reply to German ruthlessness, by the stopping of even conditional contraband (including food) carried in neutral ships to neutral ports, if an ultimate German destination were suspected. Later the Foreign Office after long resistance, in the interests of American friendship, to naval and public opinion, took advantage of the *Lusitania* crisis to permit a declaration adding cotton and nitrates to the antiquated list of absolute contraband. The blockade was early felt in Germany; bread-rationing, for instance, began in February.

1915. Western Front.—Spring witnessed the first of a two-year series of badly co-ordinated limited offensives with heavy preliminary bombardment, fearful losses, and no distinctive gains. The British attack at NEUVE CHAPELLE (March 10–13) produced a net gain of three square miles, and a loss to each side of some 12,000 men. The main French spring attacks (March 27–Apr. 1), an attempt to pinch out the St Mihiel salient and a renewal of the Champagne offensive, won at Éparges and Perthes limited successes of no strategic importance and at frightful cost. It was the failure of these spring offensives which convinced the Germans they could safely defend the West with small forces and attack boldly in the East. The German summer offensive (intended only as diversion) began the **Second Battle of Ypres** by a break-through (Ap. 22) on a front Steenstraate—St Julien—Gheluvelt with the unexpected use of chlorine gas, followed by bitter fighting between Steenstraate and Hooge and round Hill 60, E. of St Eloi, till May 24th, the British having to withdraw to a new line nearer Ypres.

This attack crippled the British share in the Allied summer offensive. Attacks NE. of Neuve Chapelle (May 9) and at Festubert (15–20) won no important advantage. The French offensive was against the Loretto-Vimy ridges dividing Arras from Lens. Foch's hope for a break-through in the first attempt (May 9) completely miscarried. A second attempt (June 16) similarly failed to advance beyond the ground first won. But no better fortune attended the Crown Prince's attacks in the ARGONNE (June 26–July 12).

The great Allied autumn offensive was planned by Joffre to pinch out the German centre by several converging attacks, with great initial numerical superiority in each case. The French attack in Champagne from Auberive to the Aisne (Sept. 25) penetrated the German front but could not take the 2nd line. Yet it nearly forced a wide German withdrawal. The advantage of a gap made in the 2nd line (28–29) was lost through bad staff-work, and a third attack won only Tahure (Oct. 6). A renewed French attack on the Vimy ridge (Sept. 25) secured only the lower slopes. The British attacking on their left from La Bassée and Grenay won LOOS and penetrated NE. of Lens; their left reached Hulluch, but their right was badly held up by the French failure. Both right and centre had a flank in the air, reinforcements arrived late, exhausted, and provisionless. Consequently the whole line fell back, and after breaking all the German lines and reaching Lens, little was retained save Loos and part of the Hohenzollern redoubt. The three autumn offensives, at terrific cost in men and munitions had won 50 square miles of unimportant ground. The Germans had been able to hold on for the few days necessary till the reinforcements arrived which had left the Eastern Front before the offensive.

In December there were notable changes in personnel, Sir Douglas Haig succeeding to the command of the British Expeditionary Force, while French and Robertson went home, the latter as Chief of the Imperial General Staff. Marshal Joffre became Commander-in-Chief of all the French armies, with Castelnau as his Chief of Staff commanding in France. Joffre's appointment was strange. When the French Chamber met in January after the government's return from Bordeaux, the growing agitation against Joffre as well as against the War Minister Millerand at last found expression, at first in the Secret Committees, later in general debates, which ended in the replacement of Millerand by Galliéni in a new Briand cabinet; but Briand promoted Joffre. Yet at bottom it was a left-handed promotion.

1915. Italian Front.—Italy's attitude had been governed by several factors. (1) The Triple Alliance was formally 'defensive.' (2) Austria was under treaty obligation to forewarn Italy before any action in the Balkans, and to ensure her 'compensation' for any advantage gained. The warning she had not given, and she delayed in promising compensation. (3) The popular Italian 'irredentist' movement maintained tension with Austria. (4) Italy had long maintained parallel with the Triple Alliance, treaty-understandings with England, France, and Russia. (5) She had long ago warned her allies that she would not fight England, whose enmity Italy's geographic and economic situation made specially dangerous.

On August 1, 1914, Italy declared her neutrality on the first two considerations, though influenced by the others. Thereafter her government virtually auctioned the country's neutrality or adherence to the highest bidder. Under German pressure Austria steadily increased her offers, but Italy's price even for continued neutrality mounted still faster. Contemporary negotiations with the Entente ended in the Treaty of London (Ap. 26, 1915), Italy's price for adhesion being Trieste, the Trentino, Slav lands in Dalmatia, the Dodecanese, control of Albania, and potential claims in Africa and Asia Minor, terms which long delayed peace with Austria and grievously complicated the Versailles Conference.

Italy declared war on Austria on May 23d, and directed her efforts to secure the two Austrian areas of Italian speech, Trentino and Trieste. In the former the Italians progressed some ten miles in 1915, but the main attack was eastward, where in four battles they crossed the Isonzo on a wide front, and round Tolmino and Gorizia got a footing on the heights beyond. Progress towards Trieste was negligible, as the natural defences of the Carso had been rendered impregnable by the Austrians. To secure their left flank, the Italians won the heights commanding the main Austrian debouching points on to the Venetian plain.

1915. Eastern Front.—Russia's tragedy in 1915 and 1916 was rotten administration and munition-shortage. Months of ostrich-like delusion ended in frantic appeal to the Allies (Dec. 1914), whose own shortage was then lamentable. Many Russian armies fought almost unarmed till the summer. Thereafter imported as well as home-produced supplies partially filled the void, but transport was difficult and precarious till completion of the Murmansk railway late in 1916.

To clear East Prussia again, Hindenburg began the 'Winter-battle of the Masurian Lakes' (Feb. 7–24). The Russian right was driven back to the Niemen, where fighting was heavy till April, while at Augustów (Feb. 14–21) the left had lost 100,000 prisoners. The German advance towards Riga, begun (Ap. 27) as a diversion from the Galician attack, by its too great success seriously diverted the supply of troops to Galicia without itself achieving major strategical ends. Libau was captured and Mitau approached, but in June the Germans retired to the upper Windau. Further south a German counter-offensive (Feb. 5–27) from Toruń and Mlawa had rewon Sierpe and Płock and temporarily secured Przasnysz, while heavy fighting there and west of Warsaw (June) had no decisive effects.

In Galicia the struggle for the Carpathian passes continued, and an Austrian advance on Stanislau (Feb.) cleared the Bukowina and almost reached the Dniester. The Russian stand at Koziowa prevented the retreat from spreading further west. Przemyśl, despairing of relief, capitulated unnecessarily (March 22) and freed Russian troops for a new offensive (March 25–Ap. 15), which cleared the Beskid passes, but nothing more. Henceforward the Germans began regularly to stiffen with German divisions all Austrian corps intended for serious offensives.

On failure of the Allied spring campaign in the West, Falkenhayn massed Austro-German troops for a break-through in Galicia, where the Russians were known to be suffering from appalling munition-shortage. Artillery preparation hitherto unprecedented heralded the main attack (May 2), which broke the Russian front at GORLICE and carried it back to the San (11). Heavy fighting gave the Austrians that line with Jarosław (18), but Russian counter-attacks further north (21–31) delayed the advance till Przemyśl had been evacuated (June 3). Meanwhile a new enemy onslaught from the Carpathians approached Stryj (May 31) and threatened Lemberg from the flank. Though this was held on the Dniester (June 9–18) the direct eastward advance secured Gródek (19) and began to outflank Lemberg to the north. The city fell on the 22d. By the 30th the first stage of the Austro-German offensive ended with line on the

Gnila Lipa. Galicia had been almost cleared, but while the Russian Warsaw salient remained, further eastward advance was a dangerous flank-exposure and neglect of a great opportunity to nip out that salient by simultaneous attacks from north and south. The Austrian attack therefore turned northward between Vistula and Polish Bug, with heavy fighting at Krasnik (July 6–11), while the eastward advance was carried to the Zlota Lipa.

Falkenhayn's great offensive began in the south with the continuation of these movements, but Mackensen, meeting heavy resistance, had not reached Lublin or Kholm by the 26th, and the Austrians made little headway. For the northern attack Falkenhayn had chosen the sector on each side of Przasnysz. Gallwitz starting on the 12th had by the 25th crossed the Narew, while on the other side of Warsaw Woyrsch had broken through to Deblin. The Russians began to evacuate Warsaw (25). Hindenburg, allowed to run a northern side-show, won Windau (18) and passed Shavli, but Falkenhayn refused him reinforcements to make this a major operation. By August 13th Hindenburg had won Mitau, threatened Friedrichstadt and Dvinsk, but was held up at Kovno. The struggle round Warsaw was more vital. With Germans at Gora Kalwarja, Blonie, and approaching the Bug, successful evacuation became improbable, and was secured only because Hindenburg retained in Courland reserves vital to the Narew army, while Mackensen, though taking Lublin (July 30), failed to reach the Warsaw-Brest railway in time. Warsaw fell (Aug. 5), but the enemy advance had changed from envelopment to a simple eastward drive in continuous line. Hindenburg was now allowed to pursue his original plans against Grodno and Vilna (Aug. 28). Grodno fell, but attempts on Vilna, Dvinsk, and Riga failed, and Falkenhayn urged their cessation. Meanwhile a converging attack secured Brest-Litovsk (Aug. 25) and unwisely advanced on the Pripet marshes, where success was doubtful and of dubious value, while the continued advance postponed the Serbian campaign and endangered the Western front. Falkenhayn also inadvisedly permitted the continuation of the Hindenburg offensive and an Austrian offensive which won Kowel, Łuck, Brody, and the Siret. The Grand Duke Nicholas now paid for a disaster which was not his fault by transfer to the Caucasus, Alexeiev becoming Chief of Staff to the Tsar.

Hindenburg, though warned of the necessity of releasing troops for the West, began a new offensive (Sept. 8), which secured Vilna (18) but failed at Riga and Dvinsk. The German centre advanced to Pinsk (16), but in the south the Austrians maintained themselves with difficulty east of Łuck, and were thrown back from the Siret in spite of retaining troops badly needed against Serbia. As Hindenburg could no longer hope for success in time, Falkenhayn insisted (Oct. 3) on the belated transfers to the west and south. This led to strained relations, and Hindenburg continued to attack Dvinsk and Riga till mid-November. Elsewhere the depleted German forces stood on the defensive, while the Austrians (Nov.–Dec.) lost ground before a new Russian offensive.

Poland was now wholly in enemy hands, the Germans establishing a government at Warsaw, the Austrians at Lublin. But the ultimate disposal of the country was more than any other question to strain Austro-German relations till 1918. Of the many solutions discussed, the most favoured were its embodiment within the Hapsburg monarchy, or 'independence' under close German protectorate. Austria might have had the former in 1915, could German-Austrian and Magyar have agreed on the constitutional issues involved. Thereafter increasing German preponderance over her partner favoured the second alternative, especially as the Poles might fight more readily for an 'independent' Poland. But though a joint Austro-German declaration was made on these lines (Nov. 1916) no real agreement was reached.

Dardanelles Campaign.—The British War Council decided (Jan. 23) on an attempt to force the Dardanelles by purely naval action. Admiral Fisher only consented under protest, but Kitchener, Churchill, and the Admiralty staff approved, as the reward of success—collapse of Turkey and ability to munition hard-pressed Russia—was high, and the special circumstances were held to modify the orthodox objections to a naval attack on land-forts. Too late events elsewhere enabled Kitchener (Feb. 16) to withdraw his initial refusal to send troops. Meanwhile the naval attack began successfully (Feb. 19–25) with the destruction of the outer forts, and the sweeping of the mine-fields half-way up to the Narrows. The purely naval attempt to force the Narrows (March 18) was abandoned after initial successes, thanks to the loss of four ships in an unsuspected mine-field. Admiral de Robeck also distrusted the fate of the fleet, should it force the passage without securing the shores. He therefore refused to renew the attack without the support of the army now assembled at Mudros under Ian Hamilton. Hamilton, on Kitchener's instructions, refused to move till plans were matured and the expected reinforcements—delayed by Kitchener's inability to decide between the claims of Gallipoli and of a Western offensive—had arrived. A great opportunity was missed, for Turkish accounts emphasise the strong probability of success if the naval attack had been pressed. As it was, the amphibious attack was postponed till April 25th, but the reinforcements arriving meanwhile were outweighed by those brought up by the Turks, while their despatch had made the failure of the Western offensive more certain. A landing was forced by the 29th Division (Ap. 25) at five points round Cape Helles (BATTLE OF THE BEACHES). Joining forces, they failed in attacks on Krithia (Ap. 28 and May 6–8), after which trench-warfare conditions supervened. On the 25th also the Anzac corps (Australians and New Zealanders) had landed north of Gaba Tepe, but were unable to gain a footing on the Sari Bair massif. By May 8th there were already 20,000 British casualties. At home political tension over the expedition had brought about Fisher's resignation (May 15) and, combined with the Shell Controversy, a political crisis, during which decisions and reinforcements were delayed for a month, so that no great military attack was possible till August, by which time the Turk had received still greater reinforcement. Four separate attacks from Helles in June and July failed owing to shortage of munitions, such supplies as there were having been diverted to the Western offensive. Failure was offset by the daring of allied submarines, which passed through to the Black Sea twenty-six times, inflicting great loss on the Turkish navy and shipping. The grand military attack began August 6th; the Anzacs, after securing a partial hold on the Chunuk Bair ridge, were driven back (10), while the advantages of complete surprise in a new landing at Suvla Bay were thrown away by the general's misjudgment, so that only another narrow foothold was gained. The diversion of reinforcements to Salonika in October ended all hope of further military advances in Gallipoli. On the advice of Munro, confirmed by Kitchener, evacuation was decided on, while the Admiralty vetoed Commodore Keyes's plan for a new naval attack. The perilous evacuation of Suvla and

Anzac (Dec. 20) and of Helles (Jan. 8) was completed almost without loss, but British total casualties exceeded 200,000. So ended the greatest 'sideshow' of the war, the greatest exhibition of valour, of bad staff-work, and of the evil of divided counsels in the higher political control. From enemy evidence it is plain that on several occasions greater persistence would have won the day and put Turkey out of the war.

1915. Balkan Fronts.—Turkey's belligerency had made Bulgaria's attitude doubly fateful, since her adhesion to Germany would complete Russia's isolation from her allies, adhesion to the Entente Powers Turkey's. Germany could offer Bulgaria Serbian Macedonia, and perhaps Greek Macedonia and Rumanian Dobruja, should those states not join Germany; the Allies, unwilling to provoke Greek or Rumanian hostility, and unable, thanks to Russia, to sacrifice Serbian interests, could offer Bulgaria only Turkish Thrace, part of which Germany induced Turkey herself to promise Bulgaria for adhesion to the Central Powers. At the last moment the Allies made offers at the expense, and over the heads, of Serbia and Greece, but too late. On September 6th, 1915, Bulgaria agreed to join the Central Powers in an invasion of Serbia.

Meanwhile Greece had arrived at August 1914 with a pro-German king, a pro-Ally premier, Venizelos, and a people determined on neutrality. A defensive alliance with Serbia against Bulgaria was of debatable obligation as against Austria. Venizelos's early plans for intervention failed, thanks to Allied attempts to keep Turkey neutral, and later to win Bulgaria, with territory claimed by Greece, who was apparently expected to make this sacrifice and to join the Allies on the strength of vague promises in Anatolia. On Bulgar mobilisation (Sept. 1915) Venizelos, despite royal opposition and popular coolness, declared for the fulfilment of Greek treaty-obligations towards Serbia, and inquired after possible Allied support with forces based on Salonika. Two divisions were transferred from Gallipoli to Salonika (Oct. 5) and prepared to receive the main Allied force, though Venizelos had now fallen and the Greek government was protesting against the 'invasion.' Despite this and the fact that the troops would almost certainly be too late to save Serbia, the French on political grounds decided to use Sarrail's new 'Army of the East' in Salonika, and induced the British to co-operate against their better judgment. Though the Bulgarian attack (Oct. 4) had produced the *casus fœderis* of the Graeco-Serb alliance, King Constantine and his generals judged the risks of helping Serbia too great and the rewards too uncertain, and proclaimed their continued neutrality. Thus the irruption of the main Allied force on a neutral and unwilling country inspired painful comparisons with Belgium's fate —and the forces were too late to save Serbia. For meanwhile the Austro-Germans had crossed the Danube (Oct. 7), and the Bulgarians all their western frontier (11) into Serbia. Falkenhayn's plan was for an Austro-German sweep up the Morava, joining hands with the Bulgarian right and centre, while the Bulgarian left pressed on rapidly and cut off the Serbian retreat towards Salonika. The main advance was slow, reaching Kragujevac only on the 30th, and linking with the main Bulgarian force only after the fall of Nish (Nov. 5). Austrian attempts to complete the encirclement of the Serbs by attack from Bosnia made little progress. But the Bulgarian centre had reached the vital Nish-Salonika railway by the 21st, and their left sealed Serbia's fate by driving through (Oct. 29–Nov. 5) between the Serbs round Skoplje and the Allied force from Salonika, which had by now reached the Tzerna. French attacks (Nov. 5–19) failed to break through to the Serbs, who were now divided, one force defending Monastir, the other being shepherded from NE. and SE. towards the Kosovo Polje. After a last stand here (Nov. 18–25) the latter retreated across the Albanian frontier (Dec. 1), losing all guns and baggage. On the coast they joined the southern force which had been driven from Monastir (5). Picked up by Allied transports they were, after a period of rest at Corfu, incorporated (May 1916) in the Allied Salonika force. Meanwhile by December 1st that force, lying between Tzerna and Lake Doiran, had had in face of attacks from three sides to execute a difficult retreat to the Greek frontier, behind which they entrenched for the winter. The Germans, to avoid conflict between Greek and Bulgar, halted their joint forces on the frontier. Salonika had been saved from becoming a German submarine base, but Serbia had been submerged, Russia was more than ever isolated, and the Central Powers now had several easy routes to Constantinople.

1915. Other Fronts.—In the Western CAUCASUS battles at Sarikamish and Ardahan (Jan.) ended the Turkish advance. Further east a Russian drive had to turn aside to repel a Turkish advance into W. Persia (April), but in autumn cleared the upper Euphrates as far as Mush. A pro-German rebellion of the Persian gendarmerie necessitated a Russian advance on Tabriz, Hamadan, and almost to Tehrān (Dec.) which in turn diverted them from a southward advance to relieve Kut.

In MESOPOTAMIA the first serious attacks on Basra and Kurna were repulsed (April), and a renewed attack (June) was repulsed and pursued by a naval flotilla which took Amāra. Thence, having previously secured An Nāsirīya (July), the British advanced and secured Kūt-al-Imāra (Sept.) by a well-planned attack. Townshend was then ordered against his own judgment to advance on Baghdād, though this had not been contemplated, and neither men, transport, nor supplies were adequate. A successful dash was the only hope, but Townshend was held up (Nov.) by strongly fortified Turkish lines at Ctesiphon, 30 miles from Baghdād. His small force suffered heavily, and had to begin a terrible retreat, reaching Kūt December 3d. There they were at once besieged by the Turks, who constructed the strong Es Sinn entrenchments against relief forces coming up either Tigris or Shatt-al-Hai.

In EGYPT the main Turkish attack on the Suez Canal (Feb.) and subsequent raids were all repulsed, but in autumn preparations were discovered for attack on still larger scale. An advance from three sides on GERMAN S. W. AFRICA captured Windhoek (April) and secured the last German surrenders to Botha in July, while similar converging attacks in autumn reduced the CAMEROONS by February 1916. But attacks from all sides on GERMAN E. AFRICA had little success, though the colony's isolation was complete.

1916. Naval.—The greatest naval battle of the war was fought off JUTLAND (May 31), where the German Battle Fleet of some 70 units under Scheer was cruising, preceded by an advanced guard of 40 lighter units under Hipper. Warning of this venture brought out the hundred units of the British Battle Fleet under Jellicoe, with advanced guard of 50 under Beatty. Hipper, meeting Beatty in the afternoon, drew him towards Scheer, meanwhile sinking two of his best cruisers. Beatty on sighting Scheer's fleet turned back to decoy it towards Jellicoe, meanwhile continuing the action with rather serious losses. Owing to faulty liaison and communication it was only at 6.25 P.M. that Jellicoe deployed across the head of the German advance, and made the engagement general. Scheer,

by a dangerous but successful manœuvre, turned away under cover of smoke-screens, returned too soon —for reasons still obscure—so recommencing the general action, then turned away once more under cover of smoke-screens and torpedo-attacks which caused Jellicoe to sheer off. Beatty again caught up, but Jellicoe was slow to follow, and night fell before he could again engage. Though naturally declining the gamble of a night-battle, he hoped to prevent Scheer's escape in the darkness. Scheer, however, cut through the smaller craft at the tail of the British line, inflicting serious losses, and next day was safe within his own mine-fields before there was opportunity for a British attack. At every phase of the fight British forces were superior in weight and number, but thanks to misunderstandings and unexpected weaknesses in armour and armament, they not only let Scheer escape, but suffered approximately twice the German loss in men and tonnage sunk. Jellicoe in this battle, as in all his handling of the fleet, was impressed—perhaps overimpressed—with the vulnerability of the battleship to mine and torpedo, and with the undoubted fact that while the destruction of the German fleet might affect the final issue little, even the crippling of the British fleet might be ruinous.

On August 19th the German Battle Fleet risked a last sally, but fear of submarine traps restrained Jellicoe from making or permitting a headlong pursuit certainly more dangerous than hopeful; later German attacks—on Lowestoft and Yarmouth—were the work only of lighter craft. In November the British Battle Fleet command passed to the more forceful Beatty. In the Black Sea also raids and coastal bombardments were practised by both sides.

After midsummer the rationing of Germany's neutral neighbours made the Allied blockade more real, but German submarines this year accounted for almost a thousand Allied merchantmen, besides the victims of submarine-laid mines (including Kitchener on the *Hampshire*). Yet renewed tension with America over the sinking of the *Sussex* had (Ap. 25) forced Germany to promise her submarines would cease sinking merchantmen at sight; and Scheer, holding that the Allied anti-submarine measures had made unprofitable operations thus restricted, had called off the campaign altogether till ordered to recommence (October) by Capelle, who had succeeded at the Admiralty a Tirpitz disgusted with his government's pandering to the neutral outcry against submarine ruthlessness.

1916. Western Front.—The Allies had decided (Dec. 1915) for concentration on an all-front offensive once the British were ready. But Falkenhayn, fearing no Russian attack and thinking further eastward advance undesirable, had determined to anticipate the British reinforcements by an early western offensive, choosing VERDUN as a narrow but vital front where the French must hold on and be bled white. The French, uncertain of the incidence of the main attack and of the feasibility of defence, hesitated to commit reserves to this salient or to make adequate preparations. The attack began (Feb. 21) wholly east of the Meuse, and not till the 25th did Pétain get authority to defend this east bank at all costs. In six days the Germans advanced four miles, secured the key-fort of Douaumont (26) thanks to misunderstandings, and were within five miles of the city. Thereafter, being firmly held and under fire from the west bank, they had to commit their remaining reserves in extending the attack to this bank (March 4). By May 21st the Germans had here advanced to the line Avocourt Wood-Mort Homme-Cumières. Then, transferring their main attack again to the east bank (June 1), they won Fort Vaux (7), Fort Thiaumont and Fleury (21–25), and were less than three miles from Verdun. But their reserves were exhausted, and after July 1st troops had increasingly to be diverted to the Somme; yet heavy fighting—rather to French advantage—continued round Verdun till August 20th, when Hindenburg, succeeding Falkenhayn, who was too deeply pledged to withdraw, called off the attack. Both sides had suffered frightfully, the French the worse, but they had retained Verdun, and that without necessitating the spoiling of the Somme offensive by a premature beginning to relieve the pressure. Later Nivelle, to restore morale and help the Somme offensive, launched a French counter-offensive (Oct. 24) against depleted forces, and in a few hours was back in the May positions, regaining Vaux and Douaumont. Mangin's renewed offensive (Dec. 15) in two days rewon the line of February 24th east of the Meuse, though the Germans were still on Mort Homme to the west.

Verdun had made the Allied summer offensive at once more urgent and more difficult, since French reserves were so largely exhausted; nevertheless the Allied character of the offensive was maintained. Despite the inordinate strength of the German positions, there were high hopes of a break-through to be widely exploited; short of that, at least Verdun would be relieved and the Germans deprived of initiative, pinned to a disadvantageous spot, and there worn down by a series of limited offensives pressed without intermission. The attack began (July 1) on a 25-mile front astride the SOMME with Anglo-French junction at Maricourt. Thanks to superior artillery experience and to less German preparedness in the south, the French success was at first the greater. In ten days they had reached Biaches, opposite Péronne; the British right had entered Trônes Wood but were held up at Mametz Wood till the 12th—with serious results. Further north Ovillers and Contalmaison were still German, the attack on the Thiepval Ridge had broken down, while north of the Ancre no ground was permanently gained. Ten days later the British right was throughout at the foot of the Pozières-Ginchy ridge, the left and centre had attempted little, and the French while advancing to Cléry had made little progress south of the Somme. In the second phase (down to Aug. 31) the main struggle was for the Thiepval-Combles-Maurepas ridges, apparently a small result attained at heavy cost, but really a necessary condition for the September break-through. Save at the strong Thiepval positions the crest was everywhere reached and the work completed by the capture of Ginchy, Guillemont, and Cléry (Sept. 3). The French then pushed past Bouchavesnes (12) while the British captured the 'Wunderwerk' guarding Thiepval (14). Next day a Britsh offensive, using tanks for the first time, captured Courcelette, Martinpuich, and Flers on the northern slopes. A further great advance (25–30) spread to Rancourt, Morval, Gueudecourt, and Eaucourt, and the Thiepval ridge was at last mastered. Attempts to exploit had small success owing to the breakdown of the weather, and a fourth phase (to Nov. 7) supervened wherein bitter fighting at Thiepval, Butte de Warlencourt, and Sailly led only to minor gains. A final episode 'The Battle of the Ancre' (Nov. 13–15) gave us Beaumont-Hamel, which had resisted since July 1st. The tragedy was that slow progress in August had allowed the Germans to prepare new lines, to which they retired when in September their originally rearmost line was breached, and that appalling weather prevented fresh assaults on these reserve lines when less strongly held. The cost had been enormous; even by Sept. 1st the Germans had lost more than at Verdun, yet far less than the Allies. Later

observers, noting the effect on Verdun and on Russia, and subsequent German confessions of exhaustion, have seen in 'The Somme' a justifiable effort which came very near to great success. At the time it was easy to contrast the ⅔ million casualties with the 150 sq. m. of territory regained. And it is now evident that so far as the theory of gradual attrition, rather than real hopes of a break-through, dictated these offensives they were based on a fallacy, for the Allied offensives of 1916 and 1917 were enormously more costly to the attackers than to the defence, so that attrition was working in the wrong direction. Yet once Germans had swamped Belgium and eastern France it was psychologically impossible not to attempt to push them back, just as it was psychologically impossible confessedly to plan earlier strategy on the basis of a war lasting four years.

In England it was the Government which eventually suffered for the Somme, in France it was Joffre. His replacement had long been discussed, but delayed by the difficulty of choosing a successor. Castelnau was too clerical; Foch suffered for the Somme, where he had been immediate commander; Pétain had been too free with memoranda to Head Quarters. Thanks to his work at Verdun, the choice fell on Nivelle and his proposed 'new strategy.' After six weeks of negotiation and intrigue, Joffre at the end of December got his marshalship and a sinecure, and Nivelle the command of the French armies in the West. Even in France the politicians also suffered; Briand, having cast Joffre to the wolves, did not survive him three months, and by then Foch had been recalled from disgrace to command the 'Army Group of the East' and await greater things after Nivelle's strategy had had its disastrous trial. In England discontent had long been rising against Asquith and his Government, despite the jettison of Haldane (May 1915), Churchill, and Marshal French (December). On the one hand labour unrest and sectional opposition to conscription (enforced on single men in Feb. 1916, and on married in May), on the other hand resentment at the incomplete blockade, at the Government' long resistance to inquiry into the Gallipoli and Mesopotamia tragedies, and at its postponement of an equitable system of food-rationing, all joined with the dissatisfaction over the results of attrition-methods on the Somme and over the apparent lack of the 'Nelson-touch' in the handling of the fleet, to weaken Asquith's position and prepare the way for an 'ultimatum' from Lloyd George. This ended in the construction of a 'business' cabinet under Lloyd George himself, excluding Asquith and Grey, but including an inner 'War Cabinet' to whom the further conduct of the war was entrusted.

1916. The Italian Front.—The planned Italian Isonzo offensive was anticipated by an Austrian Trentino offensive, launched by Conrad (May 14) against the wishes of Falkenhayn, who preferred to safeguard the Galician front. While the Austrian wings in the Adige and Brenta valleys made little progress, the centre, thanks largely to bad Italian staff-work, had by the end of May won Asiago and Posina and threatened to overrun the Venetian plain, and cut the communications of the Italian Isonzo army. But Cadorna had untouched reserves, the Brusilov offensive distracted the Austrians, and Cadorna re-won (June 16–July 24) most of the lost ground. He then began his proposed main offensive against Gorizia (Aug. 4) and in five days had won his objective, continuing his advance on to the hills to the SE. with increasing difficulty up to the 14th. Further attempts (Sept. 14, Oct. 9, and Nov. 11) were made to master the Carso heights, which barred the way to Trieste, but though a narrow salient was driven up to the last-prepared Austrian line there was no break-through. The year's fighting had cost the Austrians more than ¼ million casualties, the Italians nearly twice as many; the territorial losses and gains balanced; but the Italian morale was stiffened and the Austrians paid heavily in Galicia for their concentration on Italy.

1916. Eastern Front.—German concentration on Verdun and Russian disorganisation and munition-shortage limited spring operations in the east to a Russian offensive NE. of Vilna (March 7–April 14) undertaken prematurely to relieve Verdun. The costly gains were all lost in a day (Ap. 28). The main Russian offensive under Brusilov, also begun prematurely (June 4) to relieve Italy, resulted in a double break-through, north and south of Łuck and of the Dniester. In ten days both Kowel and Stanislau were threatened, but between the two gaps Bothmer's Austro-German force held firm, and Falkenhayn rushed up reinforcements to save the vital Kowel junction, at the cost of allowing the overrunning of the Bukowina, and ultimately of ending the Austrian Trentino attack and preventing a German anticipation of the Somme offensive. Synchronising with that offensive the Russians launched (July 3) (1) an attack on Baranowicze which failed completely; (2) a new attempt on Kowel from the NE., held on the Stokhod; and (3) an attack towards Lemberg which captured Brody (28). Bothmer, threatened on three sides, evacuated Stanislau (Aug. 10) but retained Halicz. The whole offensive had in three months advanced twenty to ninety miles on a 300-mile front, taken 400,000 prisoners, and relieved both Italians and British. But other strategical results were small, save that a joint Russo-Rumanian attack on Hungary had been made possible by the Bukowina advance.

Rumania had been bound to the Triple Alliance since 1883, but the bond depended on royal faithfulness rather than on popular desires. In 1913–14 Austria, informed of Russian intrigues and doubtful of Rumania's fidelity, worked for the alternative and incompatible Bulgarian alliance, to Germany's displeasure—and Rumania's. On August 4th, 1914, Rumania declared her neutrality. To a strongly irredentist people it became a question primarily of attempting to acquire Bessarabia at Russia's expense or Transylvania at Hungary's. In September Rumania agreed with Italy that their policies should remain parallel. Austria offered no such bribes to Rumania as she did to Italy, but Rumanian negotiations with Russia were slow, thanks to the conflict of Rumanian and Serbian claims in the Banat. Yet Rumania would probably have joined the Allies with Italy in May 1915 had not the Austrian break-through at Gorlice increased the dangers. Yet Hungary still kept Hapsburg offers low, and on Aug. 27th, 1916, Rumania joined the Allies, encouraged by the Brusilov offensive, having secured from Russia promises of the Banat as well as Transylvania, Bukowina, and the Dobruja, and being threatened by direct Russian invasion if she would not join. But she mistimed her decision, for Russia was now exhausted and, to make bad worse, her autumn campaign was not concerted with Rumania, but was an independent offensive on Lemberg (Aug. 29–Oct. 30), held easily at Brzezany and Brody. Despite the absence of Russian co-operation, Rumanian strategy concentrated on the overrunning of Transylvania, wherein lay that *terra irredenta* which had been the chief bait to bring her into the war. For this they neglected the chances—perhaps remote—of maximum strategic success by co-operation with the Salonika force against Bulgaria, though the necessary counter-measures were nevertheless taken

THE WORLD WAR 1914-1918
THE WESTERN FRONT

REFERENCE TO COLOURING
400 Metres
300 ,,
200 ,,
100 ,,
Sea Level

English Miles 0 5 10 15 20 25
Kilometres 0 5 10 15 20 25 30 35 40
Railways
Canals

Longitude East 4 of Greenwich

STRAIT OF DOVER
BELGIUM
GERMANY
FRANCE
LUXEMBOURG

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by Mackensen in the Dobruja. Thanks to this diversion of forces, and to the contemporaneous Russian attack on Lemberg, and the Italian on Gorizia, the Central Powers could oppose no adequate forces to the Rumanian penetration of the whole Transylvanian frontier to a depth of thirty to sixty miles (Aug. 28–Sept. 20). Yet the Rumanians only with difficulty and with some Russian help were able to retain the vital Bucharest-Constantsa railway against Mackensen's counter-threat. The defence of Hungary was entrusted to Falkenhayn, on his surrender of the supreme command to Hindenburg (Aug. 29). After victories at Sibiu and Brashov, he cleared S. Transylvania (Sept. 20–Oct. 11) and in the next month forced all the passes from Vulkan to Predeal after the heaviest fighting. A great victory at TÂRGU JIU (Nov. 16) at last opened the way to Craiova and the Walachian plain. Meanwhile Mackensen after winning the Constantsa railway (Oct. 20–27) crossed the Danube at Sistova (Nov. 23) and joined hands with Falkenhayn for the march on Bucharest. Bucharest fell (Dec. 6) and all Walachia was soon occupied. The advance was stopped on the line Focshani-Galatz (Dec. 22–Jan. 20) but the whole Dobruja had by then been won and the Moldavian passes forced, though their exits to the plain were still in Rumanian hands.

1916. Balkan Fronts.—In view of commitments elsewhere neither Germany nor Austria was anxious for large Balkan operations in 1916. The bulk of the Germans withdrew, the Austrians after overrunning Montenegro (Jan.) and N. Albania to the Skumbi, made no serious attempt even to prevent the linking up of the Italian Valona force with the Allied Salonika front. The more aggressive Bulgarians were temporarily restrained from infringing the Greek frontier from fear of adding even Constantinist Greece to their enemies. As for the Allies, though there remained neither prospect of saving Serbia nor pretext of helping Greece, considerations of prestige retained the Salonika force, the British agreeing unwillingly with this French decision. But not until March did the Allies spread again from Salonika to face the Bulgarians along the frontier from Lake Presba to Lake Doiran. The Greek failure to defend the Rupel Pass (May) against the Bulgarians entailed the extension of the Allied front into East Macedonia. The Allied forces with successive additions of Serbs, Italians, Russians, and Venizelist Greeks were gradually brought under the strategic control of General Sarrail, who proved equally incapable of handling the neutral Greeks and of inspiring confidence among the Allies. As to the former, the official attitude of the Skoulidis government—*laissez-faire* towards both sides as equally infringing Greek neutrality—unofficial obstruction and espionage, the German relations of King Constantine, and on the other hand Sarrail's tendency to treat Greece as conquered enemy territory, brought a tension to which the Rupel surrender added a climax, and induced the Allies (June) to bring the army-zone under full martial law, and to enforce by starvation-blockade the demobilisation of the Greek army, the exchange of Skoulidis for Zaimis, and the election of a fresh parliament. British dislike of this policy combined with military distrust of the whole campaign to create a situation in which for weeks together the British force would be forbidden to follow Sarrail in any offensive, while Sarrail was also hampered by Joffre's determination to control in detail the campaign of his distrusted subordinate. Under these impossible conditions the main campaign should, after many postponements, have opened on Aug. 20th. But it was anticipated by a double Bulgarian offensive, the overrunning of East Macedonia to the Struma, which was held with difficulty (Aug. 17–Sept. 14) and a drive against the Serbian front between Lakes Presba and Ostrovo (Aug. 17–31). Gradually hardening Serbian resistance became the nucleus of Sarrail's counter-offensive, which brought the French to Kenali, and the Serbs, after storming the Kaimakchalan massif, across the Tzerna. The simultaneous British offensive (Doiran-Struma) failed to take Seres, or even to hold the Bulgarians on that front. In the next six weeks the Serbs crept on to outflank Monastir to the east, the Italians and French to the west and south, but when the town fell (Nov. 19) the Serbs failed to cut off the Bulgarian retreat. No further considerable advance was made for two years. Meanwhile difficulties with Greece had multiplied. On Sept. 26th Venizelos set up a pro-Ally Government in Crete, which after transfer to Salonika declared war on the Central Powers (Nov. 23). But Sarrail now multiplied his demands on Athens, which under coercion even surrendered fleet and war-material. After the ambush of French forces in Athens (Dec. 1) further ultimata, enforced by rigid blockade, made the Allied conquest of Greece almost complete.

1916. Caucasus, Mesopotamia and Persia. The Grand Duke Nicholas's arrival in the Caucasus coincided with Turkish neglect of that front for Mesopotamian prospects. The result was a Russian offensive (Jan. 11) which took the nodal Erzerum (Feb. 16), Bitlis (March 2), and Trebizond (Ap. 18). Despite Turkish reinforcements the offensive was resumed in July, advancing well west of Erzingan and till the winter that line was substantially held.

In Mesopotamia the British relief-force advancing up the Tigris was after initial success held (Jan. 21) at the Hanna lines on the left bank 23 miles from Kūt, and an attempt (March 8) against the ES SINN lines on the other bank was no more successful. Renewed delays through munition-shortage ended in a new attack (Ap. 5–12) which carried the Hanna lines but failed before the stronger SANNĪYĀT defences in rear, nor could the British outflank them by decisive advance on the right bank. After a fresh failure of the relief-force at Sannīyāt (22), Townshend had after a five-month siege to surrender Kūt (29). Russian attempts at diversion from N.W. Persia came too late, though in June and July the Turks had to concentrate on saving Mosul from them. The British could not use the chance, being occupied in the wholesale transformation of the hastily-equipped relief-force into an army and supply-line adequate for a major offensive, actually begun on Dec. 12th by the capture of the Shatt al-Hai to within two miles of Kūt, and the initial attacks on the city's outer works.

1916. Syria, Palestine and Arabia.—The British in 1916 conjured the very real danger of a Jehad in Egypt provoked by nomad Senussi, by clearing first the coast, then the Siwa-Aswan oasis-line of Senussi, and driving from his kingdom the pro-Senussi Sultan of Darfur. East of the Nile, Murray planned to meet half-way the long-prepared Turkish attack on the Suez Canal. The gradual British advance, supported by the construction of railway and pipe-line, reached Romani and was there attacked (Aug. 4). The Turks were forced back on El 'Arish, though they escaped envelopment. A new British advance (Dec. 20) in three weeks cleared Egypt of the Turks.

Djemal Pasha, who commanded Turkish communications, had been able to scotch a French-inspired Arab movement in Syria; but with Sherif Hussein of Mecca he was less successful. That prince had been since 1915 negotiating with and receiving money from the British to lead an Arab

revolt against the Germanised Turkish Khalifate. In 1916, after attempting to win perpetual autonomy as the price of continued loyalty to Constantinople and continuing to receive Turkish subsidies till May, he next month threw off his allegiance, won over other Arab tribes, quickly won Mecca, Jidda, Yenbo', and Tarif, and threatened the communications of the Turks in Sinai. In December the British recognised him as King of the Hijāz.

1916-18. German East Africa.—After clearing the Kilima Njaro area (March) Deventer's southward thrust only reached the railway near Saranda in July, while Smuts, proceeding by way of the Tanga railway, reached Morogoro, Aug. 20th. Thus the Germans could avoid envelopment, but fell back on the Rufiji valley and the Mahenge plateau, whither also retreated the forces opposing the British advance from Nyasaland and the Belgian from Tanganyika. They had lost three-fourths of the colony. Yet Lettow-Vorbeck continued throughout 1917 to occupy an Allied force vastly greater than his scattered contingents, and so to fulfil his main purpose. But the Mahenge party was rounded up (Nov.) and next month Lettow himself crossed the Ruvuma. German East Africa had at last been cleared. Yet the Armistice found him still uncaptured, after skirmishing through half of Portuguese East Africa, and raiding German E. Africa and Rhodesia. With an average force of 6000 he had inflicted three times that number of battle-casualties and huge expenditure upon the Allies.

1916-17. Peace Negotiations and America.—Austria, under pressure of the Brusilov offensive, continued her 1915 negotiations with Russia, and even reached agreement; but loyalty to Germany prevented a separate peace, and Germany and Russia could not agree over the fate of Poland and Constantinople. A more hopeful peace-move resulted from Germany's use of her period of submissiveness to American protests against submarine ruthlessness (May 1916-Jan. 1917). Yet while President Wilson envisaged the embodiment of the military stalemate in a peace without annexations and with guarantees for the future on the 'League of Nations' lines towards which he was gradually working, England's allies were determined on annexations; England, as shown by the reception accorded to Colonel House's very conditional offer of American assistance, considered herself bound in honour, as she was in fact by secret treaty, to fight on for those annexations; Germany hoped for early military triumph and desired while keeping warm the 'Wilson idea' in case of failure, to give no premature repudiation of intentions of annexation. For while the 'No-annexation' party was gaining ground, the parties of the right under the incitement of Ludendorff were clamouring for ever-wider annexations and denouncing the pusillanimous moderation of the Chancellor. But by October military ill-success faced Germany with the clear choice of attempting to force an early peace on England by return to unrestricted submarine warfare, or retaining American friendship and using it to win an early negotiated 'Wilson' peace. The latter plan was chosen and Wilson notified, but he delayed definite proposals to the Allies because of temporary improvements in their situation, then of his own impending re-election, and later through disgust at the Belgian deportations. Austria, in greater straits than Germany, and foiled of her peace with Russia, now forced Germany to promise an early invitation to the Entente Powers to discuss peace. Meanwhile the new Austrian Emperor Karl (Nov.) proved less loyal to Germany than Francis-Joseph, and began personal negotiations with France and England, which only reached definition in March 1917, but contemplated cession of Alsace and Constantinople as well as restoration of Belgium and Serbia, yet were less yielding over the Austrian concessions—certainly rather excessive—demanded by Italy. Thus caught between Austrian urgency and Wilsonian delays, Germany launched her own invitation to the Entente (Dec. 12). Recent cabinet changes in England, France, and Russia had all strengthened the more warlike elements, and their concerted reply was one of contemptuous rejection and imputation of dishonourable motives. Meanwhile, with the atmosphere ruined, Wilson's long-delayed note arrived (Dec. 18), an invitation to each side to announce its peace conditions, using Wilson as a clearing-house. Germany resented the proposed *modus operandi*, the Allies, and especially England, the tone, which seemed to assume that war-guilt was equally divided, that the war-aims of both parties were similar, and that neither could win. Germany finally (Dec. 26) declined the invitation, while expressing willingness to join in a general conference. But meanwhile, in view of the Allies' direct answer to Germany, the champions of the alternative plan of return to unrestricted submarine warfare gained ground, and on Jan. 9th won the day—the campaign to open February 1st. Subsequent revelations of the German peace-conditions prove their utter incompatibility with the terms embodied in the Allied reply to Wilson (Jan. 10). Vainly Wilson attempted to continue his mediation down to the very opening of the submarine campaign. That was at once followed by the breaking of American diplomatic relations with Germany, though war was not declared till April 6th, 1917.

1917. Naval.—In the North Sea British bombardments of the Flemish coast and raids into Heligoland Bight answered German bombardments of the Kentish coast and attacks on the barrage across Dover Straits. Driven by sporadic mutiny to employ their Battle Fleet and hoping to assist the army's drive on Riga, the Germans forced the Gulf (Oct. 11-15) and destroyed many Russian ships.

But the great naval interest of 1917, and perhaps the issue of the war, turned on the German submarine campaign. In January the success of the Allied blockade and Austrian demoralisation persuaded Germany that victory must be won now or never. The army could promise no immediate decision, naval experts promised victory within six months if they might set aside all submarine restrictions. America would inevitably fight, but would in six months still be ineffective. Almost Germany succeeded. Had the loss of merchantmen been as heavy in May and June as in April, England would have felt the pinch; before the year's end starvation would have brought collapse, just when French morale was still low, Italy temporarily collapsed, Russia out of the war, and America not effectively in, and all depended on the ruthless and apparently pointless British sacrifices at Passchendaele. As it was, considerable sections, even in England, began agitation for an arranged peace with 'no annexations and no indemnities,' an agitation naturally countered by the government and press by emphasis on America's ultimate resources, and rigorous reticence over the danger-zone to be crossed in the struggle with the submarines, and the later military danger-zone between the time when the full effects of Russian collapse would be felt and the earliest moment of real American effectiveness. Save for the shock of March 1918, the bulk of the nation weathered these two supreme crises almost unconsciously. Thanks in part to this policy of reticence compulsory food-rationing only began in October (and then only with sugar), though price regulation and 'voluntary rationing' had proved incapable of

securing equitable sharing. But Allied inventiveness fought the submarine with Q-ship, depth-charge, mine and mine-barrage, and mosquito fleet, and protected its prey by dazzle-paint, the zig-zag course, and above all the convoy-system, introduced far too slowly because success was dubious and because it meant the diversion of half the navy from more orthodox tasks, but made more practicable on the arrival of American reinforcements. Slowly the sinkings diminished in number, and American mass-production increased the rate of replacement till, despite the year's loss of 2500 Allied ships, December saw the menace lifted. Meanwhile the Allied hunger-blockade of the Central Powers reached perfection—as destructive of the health and life of non-combatants as German air-raids or passenger-sinkings. Submarine ruthlessness increased neutral indignation till equal ruthlessness in blockade and disregard of neutral rights could be enforced without fear of effective protest. By it the British navy played as decisive a part in the collapse of the Central Powers as it had played in the defeat of the most nearly successful of Germany's bids for victory.

1917. Western Front.—The Allied plan for 1917, adopted from Joffre, included English and French attacks north and south of the Somme battle area and a French offensive in Champagne, all to be offensives of steady attrition. When Nivelle, hailed as a Napoleon after his Verdun success, replaced Joffre he modified this plan, making the Somme attacks quite subordinate to a simultaneous Champagne offensive, which was to discard attrition-tactics and be the decisive battle of the war. All was planned in detail from the exact time-table of the break-through to the last stages of the resulting war of movement round Liége. At the Calais Conference (Feb. 26) Nivelle was given command over Haig for the campaign, and friction was not lacking. The Briand ministry gave way (March 15) to the Ribot, whose war-minister Painlevé became the focus and mouthpiece of the growing distrust, both military and political, of Nivelle's plans and hopes. In two expert consultations it became clear that his hopes were not widely shared, but the ministry dare not take the responsibility of accepting his resignation and postponing the whole campaign. Yet they insisted that should the break-through be delayed for forty-eight hours, the offensive must be broken off, and Nivelle approached his task, conscious of the distrust of his allies, his political superiors, and his military subordinates. Meanwhile a new difficulty had arisen. The British had continued their nibbling offensive astride the Ancre (Jan.–Feb.), capturing Grandcourt and Miraumont, partly in preparation for the planned major offensive, partly to forestall German initiative during the delay caused by Nivelle's modifications of Joffre's plans. That initiative came, however, in the form of voluntary retreat, seriously begun on March 14th before continued British pressure, which regained touch within a week and almost prevented the halting of the retreat at the appointed line. In front of the French the retreat was deeper, faster, and little hampered by fighting. After an average withdrawal of 15 miles on a front of 80 the new 'Siegfried-Alberich' line, admirably sited and prepared, ran Henin-Croisilles-Trescault-Vendhuille-La Fère-Coucy. It could always be held by fewer troops—important when Germany was fighting five to eight—and for the moment it scarcely needed to be held, since transport difficulties over the area devastated by battle and by the retreating Germans effectually prohibited an early offensive. Thanks to Haig's prescience an Arras offensive was early substituted for one just north of the Somme, but the German retreat completely disorganised Nivelle's scheme for French attack south of the Somme and forced the improvisation of an alternative offensive NE. of Reims.

The main French attack was delivered (Ap. 15) after ten days' bombardment against the strongly fortified Malmaison and Craonne plateaux and the intervening CHEMIN DES DAMES. The day's advance averaged under half a mile, instead of the six miles of the time-table, and the cost was terrible. For three days more progress was made in the Fort Condé salient and in the subsidiary offensive round Auberive. In conference with Ribot and Lloyd George, Nivelle agreed that since, despite a haul of 20,000 prisoners, there was no prospect of a break-through and losses had been enormous (actually under 100,000, but then exaggerated), the attack must continue only by limited offensives on the old plan of attrition. On these terms Nivelle was, with Haig's support, allowed another fortnight despite the general discontent, but Pétain as the new Chief of Staff was given special supervisory powers. Though the new policy had won Craonne and both ends of the Chemin des Dames (May 5), he replaced Nivelle (May 16) and closed the offensive in pursuance of his avowed policy of husbanding French resources, postponing hope of victory till 1918, and leaving to Haig the vital task of retaining the initiative.

Meanwhile the British had delivered their Arras offensive (Ap. 9) on a 15-mile front astride the Scarpe, hoping at best to break the three German lines and so turn the northern end of the Siegfried line, at worst to prevent by this threat the despatch of reinforcements against Nivelle's offensive. The VIMY RIDGE was taken (10) and the Germans forced back on Lens (13), but Monchy fell only on the 11th and the Cojeul line on the 13th. Thus, though much had been won and 13,000 prisoners taken, no break-through was achieved, while the failure of Nivelle removed hopes of any major strategic success, yet made it essential to maintain the holding battle at Arras. Fighting therefore continued till the end of May, with capture of Guémappe, Arleux, Bullecourt, and a section of the Siegfried line. This last brought into play the Lens-Quéant switch-line, whose Lens terminus was in turn threatened by the relief-offensive of August 15–17.

Haig was to retain the initiative by a Flanders offensive he had already planned but postponed for the sake of co-operation with Nivelle. To support it Pétain authorised only two limited and cheap French attacks, one (Aug. 20–Sept. 9), restoring before Verdun the line of Jan. 1916, the other (Oct. 23–Nov. 4) driving the Germans from the Chemin des Dames across the Ailette. But this cautious policy was necessary; the casualties of April and the sharp transition from Nivelle's optimism to Pétain's confessed expectation of a fourth or fifth year of war, combined with pacifist propaganda to ruin French morale. Over wide areas no general could depend upon his troops, and though Pétain quickly settled mutinies and his minor victories restored confidence, French quiescence that autumn was largely independent of his personal desires. Yet in conjunction with the Russian and Italian collapse it would have meant German initiative and victory but for Haig's Flanders offensive, whose continuance it necessitated though the Nivelle episode had postponed its commencement till the late season made continuance costly and full success impossible. True, Germany also had her spell of war-weariness and 'defeatism' in 1917, and in July a clear majority in the Reichstag declared for a negotiated peace on very reasonable terms. But the militarists, led by Ludendorff, were able to keep ministers from yielding to this

feeling or to secure their dismissal if their spirit weakened. Even the Kaiser's hesitant moves towards peace through papal mediation could not stand before Ludendorff's determination. Yet actually there was in 1917 never a moment when peace-feelers were not being extended by one or other belligerent. But when Russian and Italian defeats had made practicable the reduction of their claims—till then one of the greatest obstacles to at least partial peace—that very change in the military situation naturally increased the annexationist demands of the Central Powers.

The original objective of the Flanders campaign was the mastery of the high ground overlooking Ypres, with ensuing amphibious attack on Ostend, and advance on the submarine bases Zeebrugge and Bruges. Abnormal rainfall ruined hopes of such exploitation, reduced already by the postponement, yet Pétain's policy seemed to make continuance inevitable—at the price of ¼ million British casualties. Thanks to unparalleled mine and artillery preparation the preliminary attack on the MESSINES-WYTSCHAETE ridge (June 7) was uniquely successful. But six weeks—the last fine weeks of the year—were needed to prepare the main attack, under full German observation. Thus surprise was absent, but even the preparations effectively prevented the Germans from profiting by the temporary French demoralisation. The first attack of the THIRD YPRES BATTLE won Pilckem Ridge but failed east of Ypres, and a fortnight's ding-dong struggle in rain and mud left few permanent gains. A second attack (Aug. 16) won Langemarck but nothing east of Westhoek. German 'defence in depth' with strong-point and 'pill-box' was proving its value, and drove the British to a counter-policy of strictly limited objectives such as were thrice secured (Sept. 20–Oct. 4), bringing the line on to the upland edge between Broodseinde and Veldhoek. The bulk of the ridge with PASSCHENDAELE itself was won (Oct.–Nov.) at devastating cost, to be justified, if at all, not by the value of the advance, but by the sheer necessity, with Russia, Italy, and France in simultaneous collapse, of keeping Germany occupied. Actually Passchendaele brought to a head the dissatisfaction of Lloyd George and the Cabinet majority with the policy of direct offensives in the West. This was the real cause of the resignation of Robertson, who had been Chief of the Imperial General Staff since 1915, and might have succeeded French or Kitchener. Haig remained, but Cabinet distrust led to delay in replacing the Passchendaele casualties, with serious results next March. That on better terrain Haig's object might have been achieved with smaller losses and greater territorial gains is suggested by the Cambrai episode (Nov. 20–Dec. 8), when Byng's Third Army breached the Siegfried line SW. of Cambrai, thanks to undue German concentration at Ypres and to new surprise tactics, using tanks without preliminary bombardment. Despite amazing initial success on the flanks, German stubbornness at Flesquières and Rumilly delayed the crucial struggle at Bourlon Wood till superior German reinforcements arrived. By pressure at Bourlon and a complete surprise attack near Gouzeaucourt these pinched out the British salient, recovering two-thirds of the ground just lost.

This critical winter saw several attempts at better Allied co-ordination. The autocratic and fiercely belligerent Clemenceau, who had replaced Ribot and begun an ultra-patriotic régime with the prosecution of Malvy, Caillaux, and others suspect of 'defeatism' and German relations, completed Painlevé's organisation of an inter-allied Supreme War Council with permanent committee under Foch. But the attempt to form an inter-allied Reserve Army (Jan. 1918) succumbed before the opposition of Haig and Pétain, and Clemenceau's own ideal of an inter-allied Generalissimo was postponed till the March disaster had taught its lesson.

1917. Italian Front.—Cadorna's plan for a massed Allied offensive on the Isonzo was reduced to a mainly Italian attack on Trieste, with its planned synchronisation with the Aisne offensive ruined by Italian delays. Attacks at Gorizia (May 14) and Kostanjevica (May 23) showed small permanent gain and frightful casualties, increased with small profit in an Asiago offensive (June) and a long struggle (Aug.–Sept.) for the Bainsizza plateau east of the Isonzo. Italian casualties in the four offensives were 350,000; she had been hampered throughout by munition-shortage, now morale also was weakened, through pacifist propaganda, food-shortage, discontent with generalship, and discouragement over France and Russia. Meanwhile to preserve Austrian morale, use troops no longer needed against Russia, and force Italy out of the war, Ludendorff resolved to launch a great Austro-German offensive. The attack fell (Oct. 24) on a sector north of Tolmino, apparently little exposed and therefore allotted to troops of weakest morale. North and south of CAPORETTO the line was completely broken, and from the Carso right round to Trentino the Italians had to retreat pell-mell to save communications. Only sixteen days later on the Piave line did they stand, thanks partly to enemy unreadiness to exploit a success beyond all expectation. The renewed attack (late Nov.–Dec.), falling mainly on the Italian left around Asiago and Monte Grappo, was gradually worn down. Allied forces hastening to relieve the tension had only come into line after the Italian stand. But though Caporetto was atoned for, it cost Italy half a million troops—two-thirds of them prisoners—and an irreparable loss of stores, guns, and ammunition, the acquisition of which, together with the moral effect of sweeping victory, did much to keep Austria in the war.

1917. Eastern Front.—The most important event of 1917 was the collapse of Russia. Riots in the capital (March 8) merged into revolution, which, on the Tsar's abdication (15) set up a Provisional Government composed of Reformist leaders of the lately dissolved Duma and representatives of the hastily created Workers' Soviet of St Petersburg. Thanks to the former group, the Allies long imagined the revolt had been one of war-enthusiasts against supposed pro-German tendencies in court circles. But the Soviet, though unable for the moment to commit the government to its programme of 'Peace without annexations or indemnities,' early focussed the predominating Russian sentiment—war weariness, while the government itself at once began the 'democratisation' of the army, with resulting destruction of discipline, especially after the cabinet changes (May) which brought Kerensky to the front. Germany, judging the situation rightly, and disinclined to stir Russian patriotism by immediate offensives, began at once to weaken her eastern armies, in quality if not at first in number. Kerensky, however, Soviet leader but no pacifist, planned with the new Commander-in-Chief, Brusilov, an offensive to restore Russian morale, hoping that democratic enthusiasm would compensate for the impossibility of strategy or surprise under the new 'democratic' army-régime. Austrian morale was hardly higher than Russian, and the two Russian offensives in Galicia, north-westward from Brzezany (July 1) and westward from Stanislau (July 8) were amazingly successful till German reinforcements came up to save respectively Lemberg and Stryj with its vital oil-wells. But the well-prepared German counter-offensive (July 19) on the Upper Strypa completely broke through the

Russian lines north of the recent advance, forcing speedy retreat to the frontier on the whole South Russian forces, with loss of almost all Galicia and Bukowina. Minor Russo-Rumanian successes in the Carpathians provoked an Austro-German counter-offensive south of Okna (Aug. 6–29), which failed, however, to overrun the Moldavian lowlands. But, thanks to the more complete demoralisation of the northern Russian armies and of the Kronstadt fleet, the Germans seized Riga (Sept. 3), captured the islands of the Gulf (Oct. 12), and landed in Estonia (23) with vague hopes of a march on Petrograd. There, however, Kerensky, after defeating Kornilov, the new Commander-in-Chief and would-be Dictator, had found himself distrusted by all parties and deserted by the Allies, who now despaired of further Russian activity and cut off ammunition supplies, which till then had far exceeded those of previous years. The Petrograd Soviet now contained a majority of Bolsheviki, who, under Trotsky and Lenin, deposed Kerensky (Nov. 7), and after vainly offering the Allies joint peace negotiations on a basis of 'no annexations,' concluded a separate armistice with Germany (Dec. 4), and began the Brest-Litovsk Peace Conference (22). Their action also made inevitable a Rumanian armistice with the Central Powers (Dec. 12).

1917. Balkan Front.—Despite continued Allied protests, Sarrail, thanks to Ribot and Poincaré, still commanded on the Balkan front. His spring offensive, grudgingly sanctioned by the Calais Conference in February, was an expensive failure, alike in the British attacks towards Strumica (Ap. 24–May 8), and east of Monastir (French, Italians, and Serbs, May 5–21). Serbian morale was now bad owing to internal dissension and distrust of the Allies, especially of the Italians and Venizelist Greeks. In Greece King Constantine was forced to abdicate (June 12) under pressure of continued blockade and military occupation, England and Italy having now agreed to this French demand. A fortnight later Venizelos arrived in Athens under French protection and declared war on the Central Powers, leaving it to an old Venizelist parliament of 1915, resummoned in lieu of fresh elections, to give a later sanction. But Greek enthusiasm hardly sufficed to send serious contingents before April 1918 into an Allied line which all the Allies had steadily been denuding of troops, in despair of any profit in remaining longer in what the Germans dubbed 'The Great Allied Concentration Camp.' Though the suggestion to withdraw again within the old Salonika lines was negatived, no serious operations could be attempted up to the end of 1917, when Clemenceau at last yielded to renewed Allied demands for the dismissal of Sarrail.

1917. Egypt and Palestine.—Though major preparations against Palestine were for an autumn attack, it was decided to risk a preliminary dash on the key-position, Gaza, in the hope that surprise and the present incompleteness of the Turkish defences would outweigh equal incompleteness in British communications and supply. The attack (Mar. 26) reached but failed to hold its objective, and a second attempt (Ap. 19) was no more successful, but the British dug in on the Wādi Ghazze line between Gaza and Beersheba. The long-prepared general offensive began (Oct. 30) under a new commander, Allenby, with a holding attack on Gaza and a main thrust which broke through just west of Beersheba, rolled up the whole line, and compelled the evacuation of Gaza and a Turkish retreat in two isolated armies on Hebron and Jaffa (Nov. 7). After pressing the latter beyond Jaffa (17) Allenby wheeled to attack Jerusalem from the NW. while the Hebron contingent were driven in on Jerusalem from the south. Allenby entered the city (Dec. 11), and by the year's end had pushed the Turk out of range of both Jaffa and Jerusalem.

1917. Mesopotamia and Persia.—After two months' fighting Kut was rewon (Feb. 24) by attack along the Tigris left bank and surprise bridging above the town. Pursuit up river was checked on the Diyālā (March 8), but after expensive failure in frontal attack Baghdād was secured (10) by again outflanking along the Tigris left bank. An attempt to advance up the Diyālā to catch a Turkish army retreating from Khanaqin before the Russians resulted in junction with the Russians, but with Turks escaping northward on Kifrī. The British line, halted in April at Sāmarrā on Tigris and Al Fallūja on Euphrates, was in the autumn brought to Hit and Tikrīt. 'Iraq and Lower Mesopotamia were securely in British hands.

1918. Naval.—Thanks to the relaying with better mines of the Dover Straits barrage and to the intensification of other anti-submarine measures both offensive and defensive, the sinkings, though exceeding a thousand, diminished steadily throughout 1918, and the Allied 'bag' of submarines steadily increased with a total of 74. General compulsory food-rationing, begun in England in February, was extended in July, by which time the acute need for it had ceased with the passing of the renewed food-crisis of March, caused by the diversion of shipping to the momentarily more urgent transport of American troops. 1918 was again a year of naval raids, of Germans against the Dover barrage, Austrians against the Otranto barrage, and Italians against Pola and Durazzo harbours. More important was the British attack on the German submarine base Zeebrugge (Ap. 22), the most daring and spectacular feat of the war. But the landing on the mole was effective only as a diversion, nor was the destruction of the bridge linking mole with mainland of major importance, while the really vital attempt to block the Bruges-Zeebrugge canal entrance left an awkward obstacle but failed to close the channel for any time. Two similar attempts at Ostend failed more completely.

It was Scheer's attempt (Oct. 29) to use the Grand Fleet for a last desperate throw that provoked the mutiny which began the German revolution. The ultimate disposal of that fleet, surrendered at the Armistice, was causing inter-allied disagreement when its German guard decided its fate by sinking it at Scapa Flow (June 21, 1919).

1918. Eastern Front.—The Bolsheviks at Brest-Litovsk demanded a general invitation to all belligerents for a peace on lines of 'self-determination,' no annexations, and no indemnities. Though Austrian and Turk feared the first principle and neither German nor Bulgar meant to accept the others, the Central Powers agreed, rightly confident of an Allied refusal. Negotiations were protracted and finally broken off (Feb. 10) owing to German insistence on engineering 'self-determination' into a cession to her of Russia's Baltic provinces, and to Trotsky's refusal to recognise the terms secured by an independent non-Bolshevik delegation from the Ukraine at the expense of an Austria now anxious only for peace and food. Immediate German advance along the whole battle-front brought Trotsky back to Brest-Litovsk to sign a treaty (March 3) which left Russian Poland to the Central Powers, and also all the Baltic lands save Riga, under vague promises of future plebiscites. Rumania, now isolated, had (March 7) to accept terms involving continued military occupation and economic exploitation of her territory. From Rumania and the Ukraine the Central Powers obtained large supplies; hopes of similar aid from Russia were frustrated by civil wars waged from Caucasus, Black Sea, Archangel, and Siberia by counter-Bolshevik forces with Allied backing.

1918. Western Front.—Ludendorff, freed on the Eastern Front and determined to stake all on one throw in the West before America could effectively intervene, staged in the spring of 1918 a series of offensives of which the first was directed against the British right. Weakness here, especially in the most southerly Fifth Army, was realised, but apparent German preparations at Ypres and Reims and the divided Allied command prevented due concentration here, while the British Cabinet, appalled by the Passchendaele casualties, was reluctant to send across the large reserves in England to encourage thoughts of another British offensive.

Attacking (March 21) from Arras to La Fère the Germans everywhere progressed, but on their left broke through so decisively that the main attack was transferred southward and turned retreat into rout. By the 23d the British right behind the Somme above Péronne had lost cohesion and contact with its neighbours. The Germans now aimed to divide British from French and to roll up the British northwards. Their right being held (26) between Monchy and Thiepval, and the planned extensions north of Arras failing owing to Haig's strategic withdrawal, Ludendorff concentrated still further on his left, where tardy French reinforcements only permitted the beginning of stabilisation (29) behind Albert, Moreuil, and Montdidier. The Germans then (Ap. 6–9) cut out the new salient south of La Fère. The Franco-British junction and Amiens had been saved—with loss of 100,000 prisoners and 1200 guns, but Germany had used up thirty divisions originally earmarked for later stages of the great offensive. The Allied peril, and especially Pétain's hasty intention to cover Paris at the cost of breaking connection with the British, had brought to a head the old question of unity of strategic command of the Allied forces. The attempted solution of an Inter-Allied Military Council at Versailles, arranged at Rapallo in 1917, had proved cumbrous and inadequate. Now (March 26) Marshal Foch was given powers almost amounting to those of an Allied Commander-in-chief, and that thanks quite as much to Haig as to Milner or Lloyd George. A new German offensive, at first designed as the greatest of the series, began (Ap. 9) between Armentières and La Bassée against a line still denuded of troops for the Somme defence. In three days the Lys was crossed to Merville, Béthune outflanked though saved from frontal attack by a fine stand at Givenchy, Hazebrouck in gravest danger till adequate reinforcements arrived (13), and with Ploegsteert lost (11) as well as Merville, Armentières could not be held. Checked towards Hazebrouck, the Germans now concentrated on widening the new salient southwards against Béthune and northwards against the Kemmel hills. Attack from Houthulst Forest was to complete the pincer-grip on Ypres, but was foiled by a timely British retreat from Passchendaele. Kemmel fell (25) but not the heights further west. Thus Ypres was saved—shorn of most of its salient—but it had taken two-thirds of the Allied reserves to prevent complete disaster.

The next German offensive was at first intended to draw Allied reserves from Ypres. A surprise attack between Soissons and Reims (May 27) carried the strong but lightly held Chemin des Dames, and in five days reached the Marne east of Château Thierry. Pétain concentrated on preventing the lateral enlargement of this salient, westwards where Soissons was lost and Villers Cotterets and Montigny with difficulty saved, and eastwards where Reims still held though surrounded on three sides. His success (June 1–7) made it dangerous for the German centre to deepen the salient, yet taken in conjunction with the March results, it had created a dangerous French salient round Compiègne, whose pinching-out would threaten Paris. Yet failing this the German Marne salient was itself perilous. Instead of retransferring the attack to the Ypres front they must fight on here where Allied reserves were now concentrated. Consequently the attempt on the Compiègne salient (June 9–13) had small success. The westward push on Villers Cotterets failed, and the main southward push from Montdidier to Noyon missed Compiègne by six miles and won even less ground further west.

Ludendorff next tried to pinch out the French at Reims (July 15–17), by frontal attack east of Reims which failed, and by crossing and advancing astride the Marne on Épernay, a plan abandoned after early success and heavy loss owing to unexpected contact with reserves really massed by Foch to begin his counter-offensive by pinching out the Marne salient. This return attack under Mangin (July 18), on which Foch had risked his whole reputation, though directed against the whole salient, concentrated especially on Soissons where the main German communications with the whole salient could be cut, an object achieved (19) despite reckless use of German reserves. Thanks to this success and to direct northward pressure from the Marne, the German centre steadily retreated to the Vesle (Aug. 4) where Foch, intent on saving reserves for his main offensive, was content to halt.

The first move in that offensive, intended to free Amiens and its lateral communications from bombardment and risk of capture, commenced with a surprise attack launched (Aug. 8) from the Somme to S.W. of Montdidier. Though not uniformly successful it caused Ludendorff within twenty-four hours to recommend that the war be ended. Within three days the British had reached Chaulnes and approached Roye, while further south the French were outflanking the Petite Suisse massif by advance on Lassigny. A fortnight's further fighting brought only local gains. But assisted by Mangin's minor offensive which advanced (Aug. 17–21) from the uplands north of Soissons to the Ailette, the French had been able to master the Petite Suisse massif and close on Noyon. The main offensive was now, thanks to Haig, transferred northwards to clear the Arras-Albert railway, and to take in flank the Somme area where the old devastation and concentration of German reserves multiplied the difficulties of frontal attack. After reaching the railway by surprise (Aug. 21–22) the main attack (23–25) cleared the Arras-Bapaume road, but, as expected, progressed less rapidly between Bapaume and Albert. Nevertheless Ludendorff ordered retreat to the prepared line Drocourt-Quéant-Péronne-Nesle-Noyon, a retreat (25–30) marked in places by stiff rearguard actions. After desperate struggles (Aug. 31–Sept. 2) the British broke the new line between Drocourt and Quéant and NE. of Bapaume. This achievement combined with the even more vital capture of Péronne which turned the Somme defences, decided Ludendorff to retire on the long-prepared 'Hindenburg' line covering Douai, Cambrai, St Quentin, and La Fère, behind which he had no complete defence-system. This involved the evacuation of the hard-won Lys salient within the week, while to the south the Ailette-Vesle line was surrendered, thus exposing the flank of the still-retained Chemin des Dames. On the Hindenburg line the Germans hoped to stand for the winter. Consequently in retreating they retained strong positions in advance of the intended battle-zone, and the main fighting from Sept. 3rd to 27th was for possession of these. On the 27th the British began the attack on the Hindenburg system itself from Marquion to Gouzeaucourt, with extension two days later to St Quentin. Progress

was great but uneven. Yet by October 3d the last defences of the system had been broken at Cambrai and Beaurevoir. This enabled the French to take St Quentin, and further south the Chemin des Dames. It was more symptomatic still that whereas on Sept. 9th Ludendorff, while hopeless of military success, would hear of no direct request for peace, on the 30th he was besieging the new democratic Chancellor Prince Max of Baden with demands for an instant appeal to President Wilson. This resulted in the first German peace-note (Oct. 4) requesting peace on the basis of Wilson's announced '14 points.'

Meanwhile the American forces which during recent emergencies had been perforce brigaded with Allied troops, had accomplished easily their first independent task, the pinching out of the St Mihiel salient (Sept. 12–14). They next attacked (Sept. 26) astride Meuse and Argonne, with French co-operation on the left. Missing the initial break-through which complete surprise against a lightly held line should have ensured, they soon faced massed reinforcements as well as strong positions. For though the Germans were soon willing, in conformity with the northern situation, to retire upon the 'Hunding' line (here Rethel-Vouziers-Grandpré) the retreat must be measured and its limits certain since the whole retreating line pivoted here, and the vital Mézières-Nancy railway was uncomfortably close. Thus the Allies reached the 'Hunding' line but at great cost (Oct. 10). Further west the Germans were retreating to that line from the St Gobain massif and Laon.

Nowhere was German exhaustion more clearly seen than in the speed of the Allied advance from Ypres. The surrounding ridges from Clerckem to Wytschaete, despite the old defences and devastation, were carried in a day (Sept. 28), their reverse slopes in another two, with sympathetic advance further south. Communications once reorganised, the Allies struck again (Oct. 14) from Zarren to Comines and in two days were outside Thourout and Courtrai. This entailed German evacuation of Zeebrugge, Bruges, and Lille (18–19). The Armistice line in Belgium lay east of Ghent, Gramont, Ath, and Mons.

Further south the Germans resisted to the end. After a last struggle near Cambrai (Oct. 8) they had retreated on middle Scheldt and Selle, but in two attacks (17–25) the British crossed that line throughout, the French with less effort harrying the conforming German retreat NE. of Laon. Meanwhile President Wilson, in reply to the German peace-notes, had gradually made clear that he considered peace impossible with a military autocracy, and that the Allies' conception of an armistice was not Ludendorff's of a truce for discussion but the virtual surrender and disarmament of Germany. Thereupon Ludendorff disowned the negotiations and appealed for a new stand on Germany's frontier. Wilson's third note (Oct. 23) demanding the disappearance of Ludendorff and the Kaiser led to a breach between Reichstag and Army and to the resignation of Ludendorff (26). It was left to Hindenburg to attempt a last retreat to the Meuse. But in the last real battles the British took Valenciennes and Le Quesnoy (Nov. 1–5) threatening the vital Maubeuge junction, while Americans and French began successfully a new offensive from Vouziers and Grandpré, turning the Meuse line and threatening the equally vital railway at Mézières. The last week was to Germany one of hurried and hopeless retreat with centre retiring perilously upon the Ardennes without chance of lateral escape and with a new Franco-American offensive on the Lorraine front arranged for the 13th.

News of the Turkish armistice and of separate Austrian negotiations accompanied the spread of a revolution which began with naval mutiny at Kiel (Oct. 28), and ended with the establishment of Socialist governments in Munich and Berlin (Nov. 9). On the 10th William II. fled to Holland. Meanwhile Wilson's 4th Note (5) recorded the modified acceptance by the Allies of his '14 points' and arranged for Germany's reception of Armistice conditions which she accepted on the 10th. Fighting ceased on the 11th on a line running east of Mons, Maubeuge, Hirson, Mézières, Sedan, Frênes, Cirey, and Munster. The chief Armistice terms were German evacuation of occupied territories, Allied occupation of the left bank of the Rhine with bridgeheads at Cologne, Coblenz, and Mainz; surrender of the bulk of the German fleet, artillery, machine-guns and aircraft; the abrogation of the Treaties of Brest-Litovsk—and the continuation of the hunger-blockade till the conclusion of peace. Such were the terms which Germany signed in expectation that they would lead rapidly to a peace based on the 14 points; the story of her disillusion is told elsewhere. Yet she certainly had no choice with her army retreating in disorganisation, her navy mutinous, her allies gone, her southern frontier exposed, and a medley of provisional governments and revolutionary committees at home.

1918. Italian Front.—By June 1918 the Italians, thanks to Western Front demands, were without British help, as the Austrians were without German. Austrian numerical superiority due to massed transfers from Russia, was offset by the defective morale and staff disunity which ruined their offensive of June 15th. After a successful forcing of the Piave at Vervesa and S. Donà they made no headway and lost ruinously at the recrossing (20) owing to sudden floods. Despite the signs of Austrian collapse General Diaz would attempt no large offensive till assured that enemy collapse on other fronts was imminent. But on Oct. 21st he forced the Piave throughout, isolated the Austrian centre and drove it back on Vittoria. Ten days later Austria had ordered the evacuation of Italy and demanded an armistice. The main cause of collapse had been internal disruption. Attempts to meet Wilsonian demands by the transformation of Austria into a federal state with nationalist autonomy (Oct. 16) had failed before Wilson's notification (19) that this no longer sufficed, and before the erection of Ukrainian, Croat, Czech, and German nationalist emergency governments (19–21), while Hungary refused to follow the Hapsburg policy and recalled Hungarian troops to defend the national frontiers. (See further the separate articles on the Succession States). Before the formal armistice (Nov. 4) Italian troops had nearly cleared their country and invaded Carinthia and Tirol almost unopposed.

1918. Balkan Fronts.—The effect of General Guillaumat's reorganisation of the Salonika forces had sufficed to check suggestions of evacuation or retreat within the Salonika lines, but only in September would the British government consent to new ventures on this unlucky front. The brunt was to fall on French and Serbs, attacking between Tzerna and Vardar (Sept. 15). A week's fighting ended in general Bulgarian retreat accompanied by collapse of morale. Germany had long ago withdrawn most of her troops and stopped supplies. The Vardar-Doiran front, vainly assaulted by British and Greeks (18–19) was withdrawn in conformity, while the Bulgarian right had been virtually isolated by the Allied advance which by the 25th had reached Prilep, Veles, and Strumica. Bulgaria, beset by mutiny and revolution, begged an armistice, effective from the 29th, and involving Bulgarian evacuation of Serbia and Allied rights

of occupation and transit through Bulgaria itself. Austro-German efforts could save neither Nish (Oct. 22) nor Belgrade (Nov. 1) from the advancing Allies. After the Austrian armistice (Nov. 3) the advance, joined by liberated Rumania, continued against the newly independent Hungary till a separate armistice (Nov. 13) engaged her to evacuate Croatia, the Banat, and Transylvania. In Albania von Planzer-Baltin conducted his epic retreat from the Skumbi to Gravosa (Sept. 31–Nov. 4) only to find himself on Serbian territory and the monarchy he served non-existent. Meanwhile a British advance over the Thracian frontier, added to victories in Syria and Mesopotamia, had secured Turkish capitulation (Mudros Armistice, Oct. 30).

1918. Palestine.—After the capture of Jericho (Feb. 21) two attempts were made on Amman to cut the Hijāz railway, the Turk's only supply-line to his Arabian front, but despite initial success the only permanent gain was a bridgehead across Jordan. Wholesale substitution of half-trained Indians for British units despatched to France delayed till Sept. 19th the opening of the most successful offensive of the war. The Turkish lines north of Jaffa were broken through, the infantry advancing 20 miles in the day, while in little longer the cavalry had entered Nazareth, the Turkish G.H.Q. An advance up the Jordan cut off the routed armies trying to escape eastward, advance across Jordan caught the Ma'an army at Amman, Arabs under Lawrence intercepted the remaining Trans-Jordan forces at Deraah, while Allenby's main army reached Damascus (Oct. 1). Of the Turkish troops south of Damascus three-quarters were prisoners and most of the remainder dead. Allenby's victorious advance, after cutting the Baghdād railway at Aleppo (26), halted only on news of the Mudros Armistice (30).

1918. Mesopotamia, Caucasus, and Persia.—The complete Russian collapse in the Caucasus (Feb.) enabled the Turks to push beyond the Russian frontier and encouraged dreams of an advance with the aid of pan-Islamic propaganda towards India, whither Bolshevist Russia was also threatening to spread her influence. Thus though the Turks weakened their Mesopotamian front for shadowy schemes, the situation evoked British counteraction, one force under Dunsterville reaching Enzeli whence it failed to save the Baku oil-wells from the Turk, another under Malleson proceeding through East Persia to secure the Krasnovodsk-Merv railway. Meanwhile the main Mesopotamian army after a desultory spring campaign round Kifrī, began the great advance on Mosul only on October 23rd. With admirable strategy General Marshall penned the Turkish army defending the defiles round the Tigris-Lower Zab confluence between three forces, which after desperate struggles secured their complete surrender (Oct. 30) and took Mosul (Nov. 3).

BIBLIOGRAPHIES.—Gooch, *Recent Revelations of European Diplomacy* (causerie-bibliography on origins, political and diplomatic sides); *Die Kriegsschuldfrage* (Leipzig, 1925), or Prothero (full bibliographies without discussion); Spann, *Bibliographie der Wirtschafts und Sozialgeschichte des Weltkrieges;* lists of Carnegie Endowment Series, 'Social and Economic History of the World-War.'

CHRONOLOGY.—Gleichen, *Chronology of the War* (with atlas).

POPULAR SHORT ACCOUNTS.—Pollard, Hayes, Thévenet, v. Moser (*Kurzer strategische Überblick*).

LARGER UNOFFICIAL HISTORIES.—*The Times*, Hanotaux, Schwarte.

MILITARY.—(Official Histories, published by British, German, French, and Russian governments, have, with the exception of departmental and special campaign histories, still (1927) covered only the earliest and latest stages of the war.) Memoirs of French, Robertson, Churchill, Mangin, Cadorna, Moltke, Hindenburg, and Ludendorff; Falkenhayn, *G.H.Q. and its Critical Decisions;* Hoffmann, *War of Lost Opportunities;* Dewar and Borraston, *Sir D. Haig's Command;* Villari, *The Macedonian Campaign*; Winogradsky, *La guerre sur le Front Oriental;* British Official Histories of Campaigns in Mesopotamia and in Palestine.

NAVAL.—Memoirs of Churchill, Jellicoe, Scheer, Tirpitz (also Tirpitz, *Deutsche Ohnmachtspolitik im Weltkriege*); British Official History (Corbett); German (*Der Krieg zur See*); American (Frothingham); Fayle, *Seaborne Trade.*

CAUSES, REMOTER AND IMMEDIATE.—Lowes Dickinson, *The International Anarchy;* Brandenburg, *From Bismarck to the World War.*

IMMEDIATE.—Seton-Watson, *Sarajevo;* Renouvin, *Les Origines Immédiates de la Guerre;* Montgelas, *Case for the Central Powers;* Headlam-Morley (ed.), *The Outbreak of the War;* Memoirs of Asquith, Churchill, Grey, Paléologue, Poincaré, Bethmann-Hollweg, Jagow, Lichnowsky, Andrássy, Conrad von Hötzendorf, Szillassy, Dobrorolsky. Articles and reviews in *Revue d'histoire de la Guerre Mondiale* and *Die Kriegsschuldfrage.*

POLITICAL AND DIPLOMATIC HISTORY.—Gooch, *History of Modern Europe;* Cocks, *Secret Treaties and Understandings;* *Das Zaristische Russland im Weltkriege.*

ENGLAND.—Memoirs of Grey, Addison, Churchill; Hendrick, *Walter Page.*

FRANCE.—Aulard, *Histoire politique de la Guerre;* Ribot, *Lettres;* Stieve, *Isvolsky im Weltkriege.*

RUSSIA.—Memoirs of Paléologue, Buchanan, Denikin, Rodzjanko.

UNITED STATES.—Memoirs of Bernstorff, Page, and House.

ITALY.—Giolitti, *Memoirs;* Alazard, *L'Italie et le Conflit Européen.*

BELGIUM.—*La Belgique et la Guerre.*

GERMANY.—Höfer, *Politische Geschichte des Weltkrieges;* Gooch, *Germany;* Carnegie Endowment Translations—*Preliminary History of the Armistice; Parliamentary Commission* (*1*) *On Rejection of the Peace Offers;* (*2*) *On the Internal Collapse.* Memoirs of Bethmann-Hollweg, Hertling, Helfferich, Erzberger, and Payer.

AUSTRIA-HUNGARY.—Memoirs of Cramon, Czernin, Burian, Karolyi; Nowak, *Collapse of the Central Powers;* Masaryk, *The Making of a State.*

BALKAN STATES.—Abbott, *Greece and the Allies;* Driault, *Histoire Diplomatique de la Grèce;* Rudoslawoff, *Bulgarien und die Weltkrise.* Memoirs of Djemal Pasha and Liman von Sanders.

Worm Grass. See SPIGELIA.

Worms, an ancient and interesting town of Hesse-Darmstadt, in a highly fruitful district on the left bank of the Rhine, 25 miles SW. of Darmstadt by rail. Among its churches the chief is the cathedral, a massive Romanesque building in the Byzantine style, with two cupolas and four towers, founded in the 8th, rebuilt in the 11th and 12th centuries, and carefully restored in the last quarter of the 19th century. On the hill near the church called the Liebfrauenkirche a highly esteemed wine, called *Liebfrauenmilch*, is grown. The synagogue is one of the oldest in Germany. The town-house was restored in 1884. There are manufactures of soluble glass, soap, bone-dust, printing and other machinery, furniture, patent leather, and tobacco, and a trade in the wines and the agricultural produce of the vicinity is carried on. The town has a busy river port. Pop. (1880) 19,005; (1895) 28,624; and in 1925, 45,272. Worms is one of the oldest cities of Germany (though held by the French in 1801–14); in it is laid the scene of the Nibelungenlied (q.v.). It was occupied by the Romans, made their capital by the Burgundians, destroyed by Attila, and rebuilt by Clovis. It was frequently the residence of Charlemagne and his successors, and was the place of convocation of many German diets, including that of 1521, at which Luther defended himself before Charles V. and the princes of the

REFERENCE TO COLOURING
400 Metres
300 "
200 "
100 "
Sea Level
THE WORLD WAR 1914-1918
THE EASTERN FRONT
English Miles
Kilometres
Railways
Canals
Longitude East 22 of Greenwich
BALTIC SEA
Gulf of Riga
Gulf of Danzig
RIGA
WARSAW
Königsberg
Danzig
Memel
Tilsit
Libau
Windau
Mitau
Dvinsk
Vilna
Minsk
Grodno
Białystok
Brest Litovsk
Pinsk
Lodz
Kalisz
Posen
Breslau
Thorn
Bromberg
Graudenz
Marienburg
Elbing
Allenstein
Lyck
Suwalki
Augustow
Lomza
Ostrolenka
Przasnysz
Siedlce
Kielce
Radom
Lublin
Cholm
Kovel
Rovno
Lemberg
Przemysl
Tarnopol
Stanislau
Stry
Drohobycz
Boryslaw
Sambor
Sanok
Krosno
Gorlice
Tarnow
Jaroslaw
Rzeszow
Jaslo
Cracow
Kattowitz
Beuthen
Oppeln
Neisse
Troppau
Olmütz
Prerau
Jablunka P.
Nowy Sacz
Nowy Targ
Duklа P.
Leluchow
Zilina
Presov
Kaschau
Miskolcz
Munkacevo
Volovec
Uzhorod
Kolomea
Delatyn
Kuty
Vishnitza
Czernowitz
Kamenetz Podolski
Proskurov
Khmelnik
Zhitomir
Berdichev
Skala
Husiatyn
Trembowla
Zbaraz
Zloczow
Brody
Dubno
Rovno
Kovel
Sarny
Olevsk
Pripet Marshes
Mosty
Lida
Wilna
Swieciany
Dokszyce
Widze
Rossieny
Kelme
Shavli
Mazeikiai
Telšiai
Kuldiga
Tukums
Talsi
Windau
Libau
Memel
Tauroggen
Kovno
Niemen
Kurisches Haff
Frisches Haff
Gotland
Oland
Valga
Valmeera
Cesis
Aluksne
Ostrov
Opochka
Rezekne
Ludza
Jakobstadt
Friedrichstadt
Bauska
Saldus
Aizpute
Venta
W. Dvina
Illuksta
Panevèžys
Ukmergè
Varena
Woronów
Wiszniew
Nowogrodek
Baranowicze
Slutsk
Nieswież
Stolpce
Wolkowysk
Swislocz
Narew
Bielsk
Kleszczele
Kartuska Bereza
Jaselda
Ivanowa
Drobiczyn
Kosice
Biała
Luków
Międzyrzec
Włodawa
Malowyta
Sokhod
Pripet
Turnianiec
Wysock
Berezhy
Kotoby
Stepan
Rezyscze
Włodzimierz Wolynski
Tokaczew
Sokal
Stojanow
Rawaruska
Janów
Krasnik
Krubieszow
Sandomierz
Chmielnik
Andreev
Kielce
Ostrowiec
Opatow
Pilica
Tomaszów
Piotrków
Lodz
Zgierz
Kutno
Sochaczew
Mlawa
Działdowo
Soldau
Neidenburg
Ortelsburg
Lötzen
Rastenburg
Angerburg
Goldap
Insterburg
Eydtkuhnen
Wirballen
Marijampole
Sejny
Mauer See
Spirding See
Mlynary
Osowiec
Ostrolenka
Pultusk
Plonsk
Radzanów
Sierpc
Thorn
Culm
Graudenz
Marienwerder
Deutsch Eylau
Riesenburg
Strasburg
Neumark
Briesen
Schwetz
Bromberg
Inowrazlaw
Gnesen
Wreschen
Hohensalza
Kempen
Rawicz
Glogau
Liegnitz
Lissa
Ostrowo
Kempno
Kreuzburg
Oppeln
Neisse
Ratibor
Gleiwitz
Beuthen
Kattowitz
Myslowitz
Mikotowo
Pszczyna
Bielitz
Teschen
Ostrau
Olmütz
Prerau
Zywiec

empire, commemorated by an imposing monument to Luther erected at Worms in 1868. It was an imperial free city, and its bishopric was all but a separate state. The industry and commerce of Worms were great during the Middle Ages, and its population, as far back as the time of the Hohenstaufens, averaged 60,000, and amounted to 30,000 even at the close of the Thirty Years' War; but it was almost wholly destroyed by the French in the destructive war of 1689, and, though soon after it was rebuilt on a smaller scale, it has never recovered its former prosperity. Here, in 1743, an offensive and defensive alliance was entered into by Great Britain and Austria with Sardinia.

Worms, a term destitute of scientific precision, but often applied to the members of numerous classes of invertebrate animals which are more or less earthworm-like in appearance. It is little more than a convenient name for a shape, for among the forms called 'worms' the variety of internal structure is so great that no common characters can be noted beyond the general occurrence of bilateral symmetry. The numerous classes include many types of much interest on account of the affinities which they present to other types of animals. The higher forms, known as Annelids, consist of a series of homologous segments; the lower forms are unsegmented. In the present state of our knowledge as to the affinities of 'worms,' all that can be attempted here is to give a catalogue of the various classes, arranged in a manner which cannot pretend to be more than provisional.

Plathelminthes or Scolecida (Flat-worms).	Turbellaria.—Small 'worms,' usually aquatic, often known as Planarians (q.v.)—e.g. Planaria, Convoluta, Vortex. Trematoda.—Parasitic 'flukes'—e.g. Distomum. See Fluke. Cestoda.—Parasitic 'tapeworms'—e.g. Tænia. See Tapeworm.
	Nemertea.—Free-living aquatic worms—e.g. Nemertes, Lineus. See Nemertea.
Nemathelminthes (Round-worms).	Nematoda.—Thread-worms, some free, most parasitic—e.g. Ascaris (q.v.), Trichina (q.v.), Gordius. See Thread-worms, &c. Acanthocephala.—Parasitic. Echinorhynchus (q.v.).
Annelida	Discophora, or Hirudinea. Leeches—e.g. Hirudo. See Leeches. Chætopoda.—Bristle-footed Annelids. (1) Oligochæta—Earthworms (q.v.); (2) Polychæta—marine worms, both free-swimming and sedentary—e.g. Nereis, Aphrodite (see Sea-mouse), Arenicola (Lobworm), Serpula; (3) Echiuridæ, bristly 'Gephyreans'—e.g. Echiurus, Bonellia. Related types, (*a*) Archi-annelida—primitive forms—e.g. Polygordius, and (*b*) Myzostomata, parasitic on Crinoids.
Vermes Incertæ Sedis.	*Incertæ sedis*, perhaps related to Chætopods—(1) Chætognatha—e.g. Sagitta (q.v.), (2) Rotifera (q.v.). Sipunculoidea—e.g. Sipunculus (q.v.). Phoronidea—Phoronis. Polyzoa, or Bryozoa. See Sea-mat. Brachiopoda (q.v.), or Lamp-shells.

Worms as a Disease of Childhood.—The articles dealing with Ascaris, Cestoid Worms, Tapeworm, Thread-worms, Parasitic Animals, and Vermifuges treat of the natural history of the worms infesting the human subject, and of the remedies to be employed for their expulsion, so here need only be noticed the symptoms which are usually considered to be indicative of the presence of worms in children. These symptoms are, however, in reality, only evidence of irritation of the mucous membrane of the intestinal canal, which may be due to other causes than worms, as, for instance, the presence of indigestible matter, unhealthy secretions, or the existence of a morbid condition of the membrane itself. 'Perhaps few of the symptoms—and they are very numerous—which are found while worms exist in the body can be directly attributed to the presence of these parasites, as they may all of them, or nearly all, be found also in cases where repeated purgatives have convinced us that worms are absent. They are therefore probably due in great part to the abdominal derangement which favours the development of the entozoa' (Eustace Smith, *Wasting Diseases of Children*, 4th ed. p. 231). Although then the symptoms commonly referred to the presence of worms may exist without them, yet there is a group of symptoms which, when occurring together, should, at all events, excite our suspicions. These symptoms are divisible into two groups. The first, those dependent directly on the presence of worms in the intestines, comprise loss of flesh; appetite capricious, sometimes excessive; pain or discomfort in the abdomen; irregular action of the bowels and much mucus, sometimes blood, in the stools. The second group comprises the symptoms connected with the sympathetic relations of the digestive organs, and due to some form of reflex nervous action, and amongst the most marked of them are those of the head. The sleep becomes unquiet, and the little patient is liable to start up suddenly from slumber; grinding of the teeth is common; the pupils are often dilated, and there may be headache, and sometimes convulsions—symptoms painfully like those of Hydrocephalus (q.v.), but often disappearing on the expulsion of worms. Itching of the nose is frequently present. A dry cough, unaccompanied by any signs of disease of the thoracic organs, is regarded as a sympathetic or reflex symptom of worms; and vomiting and hiccough often accompany their presence.

The Round-worm (*Ascaris lumbricoides*) may be present in the small intestine (its ordinary seat) in large numbers without occasioning any disturbance; but when symptoms are present the most prominent are sharp colicky pains about the navel, nausea, faintness, and other nervous disturbances. The Tapeworm (Tænia) may also cause pain in the belly; emaciation is sometimes very marked, but reflex disturbances are less common than in the case of round-worms. The Thread-worm (*Oxyuris vermicularis*) chiefly occurs in the large intestine, where it often exists in large numbers, looking like bits of cut thread. In a recently voided stool they are seen to be in rapid motion; hence they are called Ascarides (from the Greek *askarizein*, 'to jump'), and hence also, in all probability, the great local irritation which they occasion as compared with the quiet round-worms. The characteristic sign of the presence of these thread-worms is the itching and irritation felt at the anus. Other parasitic worms, as Bilharzia, Guinea-worm, and Trichina, are separately discussed. The worms by which Herod was eaten are interpreted to mean a kind of lice (*Pediculus tabescentium*; see Lice), credited with multiplying with awful rapidity and burrowing in the flesh.

The 'worms' implied in worm-eaten furniture or books are rather insects or their grubs; see Bark-beetles, Bookworm, Borers, Boring-animals.

The *Worms of the Dog* belong principally to the two classes Nematoda or round-worms and Cestoda or tapeworms. The commonest round-worm is *Ascaris marginata*, infesting stomach and intestines; *Dochmius trigonocephalus*, also found there, and *Trichocephalus depressiculus*, or whip-worm (in the cæcum), are of less importance. Other round-worms are *Filaria immitis*, found in the heart, and *Strongylus gigas* in the kidneys. The latter, though the largest of the Nematodes, does not always cause inconvenience to the host; sometimes, however,

there has been continual wasting of the flesh; in other instances great pain has been manifested by howling night and day; and in some instances the urine has contained blood or purulent matter, and the dog has been observed to walk with its body curved to the affected side when the worm is in one kidney only.

The tapeworms are well known to infest two hosts. In the herbivora they are found in the embryonic or cystic stage, and then appear as bladders containing fluid (bladder-worms). The most common in Britain are (1) *Tænia cœnurus*, which infests the intestines of the dog in its mature stage, whilst the cystic form, the *Cœnurus cerebralis*, is found in the brain of the sheep, sometimes that of cattle, very rarely in the brain of the horse. (2) *Tænia serrata* ('sawlike') is found in the larval or cystic form (*cysticercus pisiformis*) in the peritoneal cavity of hares and rabbits; these are eaten by the dog, and arrive at the mature stage in the intestines of that animal; the segments of the worm, as is the case with other tapeworms, are expelled with the fæces of the host, and the ova or eggs which they contain escape and are scattered over the grass, which is eaten by the herbivorous host, and there become hatched. (3) *Tænia echinococcus* is, in the mature stage, a very small tapeworm, but in its embryonic form it attains large dimensions, and is called the *Echinococcus veterinorum*, and is found in the liver, lungs, kidneys of man, the Ruminantia, and the pig. It is very prevalent and destructive to human life in Iceland. (4) *Tænia cucumerina* ('cucumber-shaped') is a small but long tapeworm, the segments of which when mature escape from the intestines and discharge their ova on the skin of the dog, and are there eaten by the dog-louse, *Trichodectes latus*, or dog-flea, *Pulex serraticeps*, in the bodies of which the ova are hatched and assume the cystic form. The fleas and lice irritate the skin of the dog, who in hunting for them with his teeth swallows some of them and the contained ova, which become hatched and assume the mature form in its intestines. In this way the presence of this tapeworm in sucking puppies is accounted for. (5) *Tænia marginata* is the largest tapeworm found in the dog, and is the mature form of the *cysticercus tenuicollis* which is found in the peritoneal, pleural, and even in the pericardial sac of various animals, particularly the Ruminants. In addition to the above the following Tæniæ are sometimes found in the dog: *Tænia krabbei*, *T. serialis*, and *T. litterata;* and another form of tapeworm, called the *Bothriocephalus latus*—which also exists in man—the cystic stage of which is found in fish, particularly the pike and burbot; and in Greenland a shorter species of this worm is found in the dog and once only in man. As to *treatment*, for tapeworms areca nut and the oil of the male shield fern, succeeded by a purgative, and for round-worms santonin, succeeded by a purgative, are the most reliable remedies.

A worm is found in the nasal cavities of the dog called *Linguatula tænioides*, and is classified in the order Pentastomida, often referred to the Arachnida. Its presence causes irregular fits of sneezing, difficult inspirations, and a discharge of mucus, containing ova, from the nose. The larval stages occur in rabbit, sheep, and many other mammals.

Worm-seed is the popular name for santonica, from which Santonin (q.v.) is extracted.

Wormwood is the English name of *Artemisia Absinthium*, the genus Artemisia, belonging to the Compositæ, being a very numerous one, found especially in the dry regions of the northern hemisphere. The Common Wormwood of Britain (*A. Absinthium*) not only acts as an anthelmintic, as its folk-etymology suggests, but possesses tonic and stimulant properties. It has yellow flower-heads. A commoner species in Britain is the Mugwort (*A. vulgaris*) with small dingy heads. *A. campestris* and *A. maritima* are also British. The flowers are wind-fertilised. Some of the species, especially *A. glacialis* and *A. Mutellina*, natives of Switzerland, are used in the manufacture of Absinthe (q.v.). Tarragon (*A. Dracunculus*) imparts the fine aroma to the vinegar of that name. The name has nothing to do with worms or wood, but comes from Old English *wermód* (*werian* to protect, *mód* mind; cf. German *Wermuth*, whence *vermouth*).—See SAGE-BRUSH.

Wormwood. (*Artemisia Absinthium*).

Wormwood Scrubs (formerly Wormholt, 'snakewood'), a district with a common and a prison, on the western outskirts of London, nearly 3 miles NW. of the Marble Arch in Hyde Park.

Wornum, RALPH NICHOLSON, the founder of scientific art criticism, born at Thornton, Northumberland, 29th December 1812, was from 1853 keeper and secretary of the National Gallery. He died at Hampstead, 15th December 1877.

Worsaae, JENS JACOB ASMUSSEN, Danish archæologist, was born at Vejle in Jutland, 14th March 1821. From the gymnasium of Horsens he proceeded to Copenhagen, where, soon abandoning the study of first divinity and then law, he turned his whole attention to the history and archæology of the north, and from 1838 to 1843 was assistant in the Royal Museum of Northern Antiquities. Between 1842 and 1854, when he was nominated to the honorary rank of professor in the university of Copenhagen, Worsaae made repeated visits to the other Scandinavian lands, to Great Britain, Germany, France, and other parts of central Europe, which retained traces of the former presence of the Northmen. These journeys, whose cost was largely defrayed by the Danish government, bore fruit in numerous works and papers of interest, three of which have been translated into English as *Primeval Antiquities of England and Denmark* (1849), *The Danes and Norwegians in England* (1852), and *Pre-history of the North* (1886). Somewhat inclined to exaggerate Scandinavian influences, Worsaae always showed himself an ardent patriot, and a strenuous opponent of the spread of German tendencies in the duchies, and his views in this direction were forcibly enounced in his *Jylland's Danskhed* (1850), especially directed against Jacob Grimm's exposition of the question of German national law. His merits were fully recognised by his countrymen; and the Danish government constantly showed its sense of the estimation in which he was held by placing him at the head of archæological commissions, and by appointing him to important posts in connection with the University and Antiquarian Museums. He was minister of education, 1874–75, and died near Holbäk in Själland, 15th August 1885.

Worsborough, a town in the West Riding, 2½ miles S. of Barnsley, with manufactures of iron, glass, paper, gunpowder, &c.; pop. (1921) 13,742.

Worsted. See WOOL.

Wörth, a village of Alsace-Lorraine, about 10 miles SW. of Wissembourg (Weissenburg), where, on the 6th August 1870, the French were defeated by the Germans (see FRANCE). The French call the battle Reichshofen.

Worth, CHARLES FREDERICK (1825–95), costumier, born at Bourn in Lincolnshire, went to Paris in 1846 and achieved great success as a dress designer, his establishment in the Rue de la Paix eventually coming to be regarded as the first emporium for the latest Paris fashions.

Worthing, a fashionable watering-place on the Sussex coast, 10½ miles W. by S. of Brighton and 56 SSW. of London. It has risen from a small fishing-village since 1760, its growth being rapid after visits of the Princess Amelia (1797) and the Princess Charlotte (1807). The climate is much milder than that of Brighton, the town and its immediate neighbourhood being protected on the north and north-east by the Downs, which shelter it from cold winds, and render it one of the best winter-resorts on the south coast. It has a long parade, public parks, an iron pier (1862; partly destroyed by a storm 1913; widened and reconstructed in 1914), and a museum and library. Fruit-growing is carried on to a considerable extent, many acres of land being covered with glass structures. Figs are grown in the open air. Worthing was constituted a municipal borough in 1890. Pop. (1851) 5370; (1881) 11,821; (1911) 30,305; (1921) 35,224.

Wotes, or VOTES. See TSCHUDES.

Wotton, SIR HENRY, traveller, diplomatist, scholar, and poet, was born of ancient family at Boughton Malherbe (now called Boughton Place) near Maidstone in 1568. He had his education at Winchester, and first at New College, then Queen's College, Oxford, and in his twentieth year proceeded master of arts. He stayed two years at Oxford adding to his great wit the ballast of learning and knowledge of the arts, then set out for a seven years' sojourn on the Continent, visiting Bavaria, Austria, Italy, Switzerland, and France. At Oxford he had begun a life-long friendship with Donne; at Geneva he made the familiar acquaintance of Beza and Isaac Casaubon; and on his return Essex admitted him to his intimacy. On his friend's downfall he betook himself to France, next to Italy, and was sent by Ferdinand, Duke of Florence, on a secret mission to King James VI. of Scotland with intelligence of a plot against him, and the Italian antidotes against poison. James on his succession to the throne of England summoned him from abroad, knighted him, and sent him ambassador to Venice (1604). Here he lived throughout the struggle with the court of Rome, and it was through his hands that Sarpi's famous history of the Council of Trent was communicated sheet by sheet to King James. After eight years he almost lost the king's favour owing to the publication by the scurrilous controversialist Scioppius, to the discredit of Protestant princes, of an epigram he had once written carelessly in a friend's album in Germany: *Legatus est vir bonus peregrè missus ad mentiendum Reipublicæ causa*, which Walton says Sir Henry Wotton could have been content should have been thus Englished: 'An Ambassador is an honest man, sent to lie abroad for the good of his Country.' But unfortunately the Latin did not leave a means of escape by the loophole of ambiguity. The king, however, was satisfied with Wotton's apology, saying that he 'had commuted sufficiently for a greater offence.' He was employed intermittently for about twenty years, chiefly at Venice, next sent to several of the German princes and the Emperor Ferdinand II., returning to England a poor man in 1624, the year before the death of King James. He was made Provost of Eton, and entered into holy orders with all convenient speed. Here for fifteen years he lived, his days gliding past in quiet study and meditation, in encouraging the studies of the more hopeful youth, in cheerful conversation with his friends, and in angling, which he called his 'idle time not idly spent.' He meant to write the Life of Luther, but at the request of Charles I. applied himself to the history of England, and had indeed begun his task when he died 'in great tranquillity of mind and in perfect peace with God and man,' December 1639. He was buried at Eton under a plain gravestone, whereon was written by his own desire this prudent pious sentence to discover his disposition and preserve his memory: 'Here lies the first author of this sentence, "The Itch of Disputation is the scab of the Churches"' (*Disputandi pruritus ecclesiarum scabies*). Another of his sayings, and one more original than this, was his advice to a young diplomatist, 'that, to be in safety himself, and serviceable to his country, he should always, and upon all occasions speak the truth (it seems a State-Paradox), for, says Sir Henry Wotton, you shall never be believed; and by this means, your truth will secure yourself, if you shall ever be called to any account; and 'twill also put your Adversaries (who will still hunt counter) to a loss in all their disquisitions and undertakings.'

Wotton's treatise on Architecture, Life of Buckingham, letters, &c. were collected as *Reliquiæ Wottonianæ* (1651), prefaced by Izaak Walton's exquisite biography in miniature. The poem on a happy life is known to all lovers of good English. See *Sir Henry Wotton*, by A. W. Ward (1897), and *Life and Letters*, by L. P. Smith (1907).

Woulfe's Bottles. See WOLFFIAN BOTTLES.

Wounds may be defined to be divisions of soft parts, including the skin, produced by external mechanical force. They are generally divided into (1) *incised wounds*, such as cuts or incisions, including those which remove a portion of the body; (2) *punctured wounds*, such as stabs; (3) *contused wounds*, in which the divided parts are bruised or crushed; (4) *lacerated wounds*, in which there is tearing of the tissues; (5) *poisoned wounds*, in which some poison or venom is inserted.

Simple, open, incised wounds will be more fully noticed than any of the others, because they have been most fully studied, and in their surgical relations are the most important. In a clean cut, whether made accidentally or in a surgical operation, three things are chiefly to be observed—viz. the opening or gaping by the retraction of the edges, the bleeding, and the pain. The *gaping* of a wound is caused by the retraction of the various tissues which are divided. Of the various tissues the skin exhibits the greatest degree of retraction, and then (in the order in which they stand) elastic tissue, cellular or connective tissue, arteries, muscles, fibrous tissues, nerves, and cartilages. In addition to the immediate gaping of fresh wounds, many wounds, if they be not prevented, will continue to retract for a long time. For example, in stumps that heal slowly, the limb terminates in a cone, in consequence of the prolonged retraction of the muscles. The *bleeding* from an incised wound depends chiefly on the size and number of the divided vessels, and on their connection with the surrounding parts, but to a certain extent on the previous condition of the wounded part, or on the peculiar constitution of the patient. Gradually, with or without surgical help, the vessels cease to bleed; and then, if the wound be left open, there is an oozing of blood-tinged

serous fluid, succeeded gradually by a paler fluid which collects like a whitish film on the surface, known as *lymph* (see under INFLAMMATION), and contains an abundance of white or colourless blood-cells, imbedded in a fibrinous (and therefore spontaneously coagulating) fluid. The nature of the *pain* cannot be made clear by any description to those who have not felt it; and it is more than probable that a similar wound inflicted on two or three persons would occasion different degrees of pain in each. There are also differences in both the kind and degree of pain, according to the place and manner of the wound. The skin is more sensitive than the deeper parts; that of the face, hands, and feet more sensitive than that of most other parts of the body. The *local consequences* of an incised wound are indicative of inflammation. In the course of an hour or more, the edges of the wound and the adjacent parts become swollen and abnormally sensitive, feel hot and aching; the sutures (if any have been inserted) become tighter, and the edges and intervening spaces gape in consequence of the swelling. These symptoms gradually subside in two or at most four days, unless there is some abiding source of irritation. Except in very severe wounds, no *general consequences* are apparent. In these exceptional cases, as in amputations, for example, Shock (q.v.) and subsequent reaction are observed. The duration of this feverish reaction or traumatic fever does not seem to bear any fixed relation to the severity of the injury. Sometimes it subsides within twenty-four hours; more often, after large wounds, it does not subside for three or four days. If constitutional disturbance should last more than four or five days after the receipt of the injury, there is probably some persistent irritation or some morbid complication.

The *healing* of open incised wounds may be accomplished, according to most surgical authorities, in five different ways: (1) *Healing by immediate union* takes place when the wounded parts being placed and maintained in contact first stick together, and then become continuous, without the formation of any new material as a connecting medium. For example, a flap of skin is raised by dissection in the removal of a tumour or a mammary gland, and is then replaced on the subjacent parts. In three days at most the union may be complete, without any indication of inflammation, there being no evident efflux of blood, no exudation of reparative material, and no scar. (2) In *healing by primary adhesion* lymph exudes from both cut surfaces, becomes organised, gradually connects the cut surfaces, and at length forms between them a firm layer of connective tissue, covered with a thin shining cuticle. These steps are well seen after the operation for hare-lip, for example. These two methods are known as healing by *first intention*. (3) *Healing by scabbing*, or under a scab, is the most natural and in some cases the best of all the healing processes. In animals it is often observed that if a wound be left wide open the blood and other exudations dry on its surface and form an air-tight covering, under which scarring takes place, and which is cast off when the healing is complete. In man this process is less frequent, because, in the first place, exudations seem to be more often produced under the scab, which detach it and prevent the healing; and secondly, surgical interference seldom allows this method to have a fair trial. The first three methods are obviously the most desirable, and should be aimed at whenever it is possible to do so. (4) In *healing by granulation* or *second intention* the wound becomes coated over with a film of lymph, which, if the wound be left open, increases, becomes reddened by the development of blood-vessels within it, and is transformed into granulations. We cannot enter into the life-history of these granulations, and can only remark that they are finally developed into a scar consisting of fibro-cellular or connective tissue, with a superficial layer of epidermis. The completion of the healing is accomplished by the gradual improvement of the scar, in which the connective tissue becomes more perfect in its character, and the cuticle becomes thicker and more opaque. (5) *Healing by secondary adhesion*, or by *third intention*, is accomplished by the union of two granulating surfaces (e.g. those of two flaps after amputation) placed and maintained in contact.

In the treatment of incised wounds there are four main points to be attended to: (1) Arrest of hæmorrhage, by pressure with the finger or a pad of lint, by cold, or, if arteries of any size have been divided, by their ligature or torsion (see BLEEDING). (2) Removal of any foreign bodies which may have been introduced. (3) Accurate apposition of the sides and edges of the wound by pads and bandages, by plasters, or by Sutures (q.v.), according to the size and position of the wound and the degree of gaping which has to be counteracted. (4) Prevention of decomposition in the wound and its discharges (see ANTISEPTIC SURGERY).

Of the other varieties of wounds it is sufficient to notice the most important points severally peculiar to each variety. Of *punctured wounds* the most serious are those which are made with blunt-pointed instruments, such as nails, pitch-forks, iron spikes, &c., for by these the injured parts are not so divided as that they may retract, but are pressed aside with much bruising, and can close again as soon as the instrument is withdrawn; and in this lies the chief danger of these wounds, because dirt is liable to be introduced and blood is extravasated, and cannot readily escape. Decomposition or sepsis or mere pressure may excite inflammation, and thus cause deep suppuration, destruction of tissues, or even general blood-poisoning. *Contused and lacerated wounds* are much more severe and dangerous than incised wounds of the same size, because the adjacent tissues are bruised and injured, and sloughing is very apt to occur. Such wounds on the limbs, if extensive, often necessitate amputation. If union is to be attempted, the rules given for the treatment of incised wounds must be followed, especial attention being paid to their careful cleaning, the removal of clots of blood, and their warm covering with some soft material, as cotton-wool. In no cases is careful antiseptic treatment at first of more importance or of more signal benefit than in severe wounds of this class. *Gunshot wounds* are merely a special group of contused and lacerated wounds, which from their great importance in military surgery have a large literature of their own.

Of *poisoned wounds* the most important are the bites of Snakes (q.v.) and other venomous reptiles, the stings of insects, the bites of rabid animals (see HYDROPHOBIA), and septic and gangrenous wounds. See also VENOMOUS BITES.

In conclusion it must be mentioned that various kinds of wounds are liable to certain complications, of which some are local and others general or constitutional. Among the former are recurring or secondary bleeding, pain, paralysis from division of nerves, and the presence of foreign bodies; whilst the latter include defect or excess of reaction, traumatic delirium, fever, erysipelas, pyæmia, tetanus, &c. Some of these complications are treated of in special articles of this work; and for the treatment of the remainder we must refer to standard works on surgery.

Woundwort. See STACHYS.

Wouwerman, PHILIP, a Dutch painter of battle and hunting pieces, was born in May 1619 at Haarlem. From his father, Paul Wouwerman, a historical painter, he inherited a taste for art. He studied first with his father, and afterwards with John Wynants. He passed his entire life at Haarlem in the assiduous practice of his art, and died 19th May 1668. Though his pictures are now highly valued, he is said to have had little immediate success, and to have lived in poverty, pretty much in the hands of the picture-dealers. His pictures are, for the most part, landscapes of small size, with figures profusely introduced, commonly in energetic action. His cavalry skirmishes, with a white horse generally in the foreground, are greatly admired for their spirit and vigour. He had two brothers, also painters, PETER (1623–82) and JAN (1629–66), who executed subjects somewhat similar, and whose works have not unfrequently been attributed to him; but, though both artists of considerable merit, they are plainly much inferior to Philip.

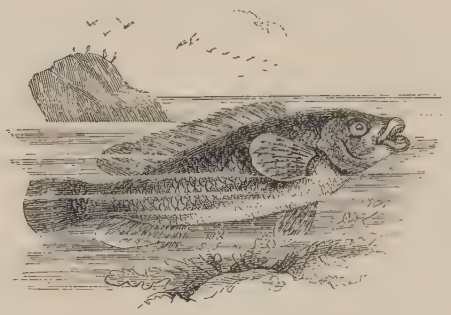
Wrack, a term loosely given to various seaweeds, especially to the Fucaceæ, common on British shores, long valuable as a source of Kelp (q.v.), and utilised as manure. See SEAWEEDS, FUCUS, KELP. For Wrack Grass, see GRASS-WRACK.

Wrangel, FRIEDRICH HEINRICH ERNST, Prussian field-marshal and count (1784–1877), born in Stettin, joined a dragoon regiment, took a distinguished part in the campaigns of 1807, 1813, and 1814, and rose steadily till in 1848 he was general and commander of the Prussian and Federal troops in Sleswick-Holstein. In that year he marched into Berlin and crushed the insurrectionary movement there; in 1856 he became a field-marshal; in 1864 he had supreme command over Prussian and Austrian troops in the Danish war.

Wrangel Island, an island in the Arctic Ocean, lying north of the eastern extremity of the Asiatic coast, and intersected by the meridian of 180° E. long. It was seen by the Englishman Kellett in 1849, again discovered by the American Long in 1867, and named after the Russian explorer Wrangel (1796–1870), who sought in vain to reach it in 1821–23. It was first explored by the American expedition under Hooper and Berry in 1881. Hooper took possession of it for America in 1881, Stefánsson for Canada in 1921. Russia vindicated her right in 1924.

Wrangler, a historic name in the university of Cambridge for those who had attained the first class in the public mathematical honour examinations, the student heading the list in order of merit being called the Senior Wrangler. The word 'wrangler' is derived from the public disputations in which candidates for degrees were in former times required to exhibit their powers. The examination, confined to mathematics, pure and mixed, was conducted by two moderators and two examiners, with an additional examiner. Down to the year 1882 the undergraduates who satisfied the examiners were arranged in order of merit in three classes—*wranglers*, *senior optimes*, and *junior optimes*. Between 1882 and 1885 inclusive those who attained the rank of wranglers in the examination held in June of each year were admissible to a higher and more special examination held in January of the following year, after which they were arranged in three divisions, according to their respective merits, but the names under each division were placed in alphabetical order. From 1886 to 1892 those who proceeded to the higher examination were placed in three classes, each consisting of three divisions, the alphabetical arrangement holding good as before. From 1893 there were two examinations of four days each, with an interval of eleven days between; those only who had acquitted themselves during the first four days so as to deserve honours being admitted to the examination of the second four days, after which they were arranged strictly according to merit. But in October 1906 the senate resolved that the arrangement by merit should cease in Part I., and that in both examinations the names should be arranged in three classes, alphabetically in each class, so that the 'Senior Wrangler' disappeared. The proposal met with not a little opposition, but a vote in February 1907 finally confirmed the resolution. The last man of the junior optimes was often called 'Wooden Spoon.'

Wrasse (*Labrus*), a genus of bony fishes representative of the large family Labridæ (Europe and N. Africa). The body is covered with cycloid scales; the form tends to be oblong; there is a single dorsal fin with a long spinous and shorter soft portion;



Ballan Wrasse (*Labrus maculatus*).

the teeth on the fused lower pharyngeal bones are adapted to crush the shells of molluscs and crustaceans; the teeth on the jaws are conical and disposed in a single series. The colours are frequently brilliant. The flesh is not much esteemed. The Ballan Wrasse (*Labrus maculatus*) is common and widely distributed, often occurring among the seaweed in deep pools on rocky coasts. It measures 18 inches or more in length; is brightly coloured, often with a red back, an orange belly, orange-red paired fins, and bluish-green unpaired fins; feeds on crustaceans and worms; spawns in spring and summer. The Cook Wrasse (*Labrus mixtus*), also known as Red, Striped, and Spotted Wrasse, is not unfrequent on the southern coasts of England. The adult male is dark greenish above, yellow to orange beneath, with stripes of blue; the female is markedly different, being red with black blotches. In length the male measures about 14 inches, the female about a foot. In summer they live near the rocks, feeding on crustaceans; in autumn they seek deeper water. Nearly related is the Goldsinny (q.v.), or Corkwing (*Crenilabrus melops*); and the allied genera Ctenolabrus, Acantholabrus, Centrolabrus are also represented on British coasts. A common American fish (*Ctenolabrus adspersus*), known by a variety of names, such as burgall, blue-fish, sea-perch, and nipper, belongs to the same set; and also related is the large Tautog (q.v.) or Black-fish (*Tautoga onitis*). Several species of Wrasse are known as Rock-fish. The Parrot-fish (q.v.) or Parrot-wrasse is the genus Scarus.

Wrath, Cape. See CAPE WRATH.

Wratza. See VRATCA.

Wraxall, SIR NATHANAEL WILLIAM, was born at Bristol 8th April 1751, at eighteen entered the East India Company Civil Service, but returned to

England in 1772, and thereafter for nearly seven years travelled over Europe—even to Lapland, employed part of the time, however, in a confidential mission from Queen Caroline Matilda of Denmark to her brother George III. He published his *Cursory Remarks made in a Tour* in 1775, his *Memoirs of the Valois Kings* in 1777, entered parliament in 1780 as a follower of Lord North, but went over to Pitt, and was made a baronet in 1813. His next books were the *History of France from Henry III. to Louis XIV.* (3 vols. 1795), *Memoirs of the Courts of Berlin, Dresden, Warsaw, and Vienna* (2 vols. 1799), and the famous *Historical Memoirs of my own Time, from 1772 to 1784* (1815; reprinted 1904). For a libel in the last on Count Woronzov, Russian envoy to England, Wraxall was fined £500 and sentenced to six months' imprisonment, half of which he endured. Violent attacks on his veracity were also made by the *Edinburgh*, the *Quarterly*, and the *British Critic*, but Wraxall printed *Answers*, on the whole, with success. He died at Dover, on the way to Naples, 7th November 1831. His *Memoirs*, continued from 1784 to 1790, was published in 1836 (3 vols.). There is an excellent edition of the whole work by H. B. Wheatley (5 vols. 1884).

Wray, JOHN. See RAY.

Wrecks are ships or goods cast on shore by the sea, and are usually distinguished from Derelict (q.v.) property and Flotsam (q.v.). But the Merchant Shipping Act of 1854 and subsequent amendments include jetsam, flotsam, ligan, and derelict. Shipwrecks therefore fall under the category of stranding or foundering; and may be caused by storms, fire, collision, leaks, fog, shoals or rocks not marked in charts, imperfect steering-gear, careless seamanship, negligence in showing shiplights, colour-blindness, inattention to soundings, disregard of currents, omission to make due allowance for correction of the compass, and other possibilities of error. Means of avoiding shipwreck are lighthouses, beacons, storm-signals, submarine signalling apparatus, and wireless telegraphy. Lifeboats and life-preserving apparatus of all kinds diminish the fatalities.

In the time of Henry III., much as in Roman law, wrecks were the property of the crown unless the owner appeared within a year and a day to make good his claim; but a ship was not accounted a wreck legally if any living thing escaped, though even then the ship was made over to the crown after a year and a day if the owner did not compear. In Scotland a law of 1429 enacted that wrecked ships and their goods should escheat to the king if they were of countries where wrecks belonged to the king; if not, 'broken ships' should have the same favour in Scotland as Scottish vessels received in the countries to which the wrecks belonged. Now all action in regard to wrecks in the United Kingdom is under the Board of Trade, who appoint receivers of wreck—customs officers and justices of peace being held bound to act when receivers are not at hand. The receiver takes evidence as to ownership, and reports to the Board of Trade. If the owner does not appear or make good his claim, and if the lord of the manor have no right to unclaimed wreck, then after a year the receiver sells the wreck, and, deducting expenses, pays the proceeds into the exchequer. If the goods or ship are recovered by private persons, Salvage (q.v.) may be demanded.

Any person knowing of a wreck must report to the receiver. Stealing wreck is a crime, also removing lights, altering them, or showing false lights to cause wrecks. *Wrecking*, or showing false lights, used to be a common practice in some parts of the United Kingdom; and a wreck occurring by the 'act of God' was regarded as a divine bounty to the natives of the district where it was driven ashore. The lives of the unfortunate survivors were by no means safe in the hands of wreckers who feared their booty might be taken from their grasp.

In spite of the disappearance of such barbarous usages, and the establishment of lighthouses, lifeboats, and all manner of life-preserving apparatus on the most exposed parts of the coasts of civilised countries, the annual loss of shipping and of life by shipwreck is very great.

Formerly a wrecked ship that went to the bottom remained there until she was entombed in the shifting mud or sand, or else had undergone a process of gradual dissolution, hastened by the ebb and flow of tides and currents. Wreck-raising was then practically undreamt of. Sometimes crude operations were carried on at sunken wrecks (see DIVING); but the object aimed at was the recovery of treasure, and not the raising to the surface of the vessel containing it. The development of science has placed in the hands of modern wreck-raisers machinery that has enabled them to lift many a fine ship from her bed, and restore her to her proper place among the floating argosies of commerce. Most of the vessels that are raised have been the victims of collision in the crowded waters of harbours and their approaches. The chief economic purpose served by wreck-raising is to keep clear the fairways leading to the large seaports, and this is now compulsory. Many harbour boards have their own wreck-removing plant. Previously, the usual practice was to blow the sunken ships to pieces; but when the disaster has occurred in shallow water this is now regarded as wasteful. When a collision takes place and a vessel sinks in the fairway a wreck-boat or a proper buoy is moored *in situ*.

But with all our modern scientific and mechanical knowledge, wreck-raising can only be carried on in comparatively shallow water. Diving operations can, of course, be carried on at a greater depth.

Among wrecks notable for the loss of life, the sufferings of survivors, for historical and literary associations, or for the heroism of captain and crew, are the following:

Many ships of the Armada on British and Irish coasts	1588
Albion (Falconer's 'Shipwreck'), on Campeachy coast	1699
Sir C. Shovel's fleet, Scilly; 2000 lives	1707
Royal George, under repair at Portsmouth; 900 lives	1782
Queen Charlotte, of 110 guns, burned off Leghorn; 700 lives	1800
St George, 98 guns, Defence, 74, Jutland; 1400 lives	1811
Kent, Indiaman, burned during storm, Bay Biscay; all saved	1825
Forfarshire (Grace Darling's wreck)	1838
Royal Adelaide, off Margate; 400 lives	1849
Birkenhead, troopship, South Africa; 454 lives	1852
Royal Charter, off Anglesey; 446 lives, and £750,000	1859
London, in Bay of Biscay; 220 lives	1865
H.M.S. Captain, off Finisterre; 472 lives	1870
Atlantic, off Nova Scotian coast; 560 lives	1873
H.M.S. Eurydice, training-ship, off Ventnor; 300 lives	1878
Princess Alice, sunk by collision in Thames; 650 lives	1878
Victoria, on Thames in Canada, upset; 700 lives	1881
Daphne, capsized at launch in Clyde; 124 lives	1883
H.M.S. Victoria, off coast of Syria; 359 lives	1893
Reina Regente, Spanish warship, off coast of Morocco; 420 lives	1895
Titanic; 1498 lives	1912
Empress of Ireland, in Canada; 1011 lives	1914
A flotilla of seven U.S.A. destroyers on the American Coast	1923

Wrede, KARL PHILIPP, Bavarian field-marshal and Prince (1767–1838), was born in Heidelberg, shared in the campaigns of 1799 and 1800, fighting at Hohenlinden, invaded Tirol and took part in the battle of Wagram with the French, and was by Napoleon made a count of the empire. He led the Bavarian troops under Napoleon to Russia in 1812; then, changing sides with his country, commanded a united Bavarian and Austrian army against the French, by whom he was defeated at Hanau. He was, however, victorious in several battles on the sacred soil of France in 1814, and was made field-marshal and prince, with the gift of

large estates. He represented Bavarian interests at the Vienna Congress in 1814.

Wrekin. See SHROPSHIRE.

Wren, a name applicable to any member of a family (Troglodytidæ) of Passerine birds, and more especially to species of the genus Troglodytes. The headquarters of the family are in tropical America, but the range extends from Greenland to the Falkland Islands, from Britain to Java. The genus Troglodytes is widely represented over the northern half of Europe, Asia, and America, and extends as far south as Algiers, Madeira, and Palestine. Among the wren characteristics may be mentioned the very short rounded wings, the usually short erect tail, the slender slightly curved bill, the long instep (metatarsal) region of the foot, and the inconspicuous brownish colouration. Wrens

Wren and Nest (*Troglodytes troglodytes*).

frequent places where they can find plenty of insects and their larvæ, besides other small animals like spiders. They occur from low-lying marshes to altitudes of ten thousand feet, but they like places with abundant cover, whether among brushwood or creviced rocks. The nearest relatives of the wrens are probably the tree-creepers, and some authorities regard dippers (Cinclidæ) as aquatic wrens.

The Common Wren, *Troglodytes troglodytes*, is a common resident bird in many parts of Europe, a summer visitor to the northern regions, a partial migrant in other places. Besides the type there are in Britain two insular varieties—the St Kilda Wren and the Shetland Wren. Very characteristic of wrens is their restlessness and power of self-effacement; they are always flitting from cover to cover, and this, combined with their minute size and inconspicuous plumage, gives them a firm foothold in the struggle for existence. The general colouring, the same for both sexes, is brown and gray; but there is an intricate beauty of bars and spots. Thus there are little white spots on the tail and wing-coverts, which become obliterated in the wear and tear of family life. As the birds flit about they utter a sharp *tit-it-tit*, which often becomes an excited churr. The true song, confined as usual to the male, is powerful for the size of the singer, and it is prolonged beyond the breeding season, even into winter. Primarily used to excite the hen's interest, the song has secondarily become a challenge to rival males, and the cocks go singing into battle. By further evolution it has become an expression of good spirits all the year round.

The typical nest is a spherical structure with a door at one side; in a covered-in nook the roof is sometimes dispensed with. Both sexes combine in building the nest, which is daintily fashioned of grass, moss, bracken, leaves, and the like, and lined with feathers inside. There are also unlined nests, usually, perhaps always, the work of the cock-bird only. Several may be made, and one of them may be used by the male as a temporary shelter. Or the young birds, hatched out and fed by both parents, may be transferred from the true nest to the 'cock's nest' after they have got on a bit. Sometimes, again, an unlined nest is secondarily raised to the level of a lined nest and used as a cradle. Finally, an unlined nest, or that of another bird, may be used as a winter shelter by a number of wrens together, probably a family party. The making of 'cock's nests' probably illustrates a lengthening out of the nest-building chapter in the reproductive cycle, and there are often two broods in the year. The use of the nest as a shelter probably illustrates evolution in progress. In any case the plasticity is interesting. The dainty eggs, white with faint reddish dots, are often eight in number—a large laying for so small a bird.

The popular natural history of the wren is in several ways quaint. Thus many people hold to the absurd idea that Cock Robin and Jenny Wren are male and female of the same species, and both birds enjoy some safety under the shield of the kindly view expressed in the saying that 'the robin and the wren are God's cock and hen.' This must help survival, but the robin and the wren are well able to look after themselves—hardy, vigorous, confident, alert, courageous, and cheerful. On or about Christmas Day in South Wales, Ireland, and France, on the occasion of the Feast of the Three Kings, it used to be customary for men and boys to 'hunt the wren,' addressing it in song as the 'king of all birds.' The meaning of this seems to be quite obscure.

Among the North American wrens one of the most familiar is the House Wren, *Troglodytes domesticus* or *ædon*, which comes much about the houses, and is very willing to nest in boxes. It is larger than the European species and even more confident. Its plumage is reddish brown above, with dusky bars; pale fulvous white below, with a light brownish tinge across the breast. To be distinguished from the true wrens are various birds to which the name is loosely applied, notably the Golden Crested Wren (q.v.) or Gold Crest (*Regulus regulus*), the Willow-wren or Willow-warbler (*Phylloscopus trochilus*), the Wood-wren or Wood-warbler (*Phylloscopus sibilatrix*). None of these are nearly related to true wrens. See T. A. Coward's *Birds of the British Isles* (1920) and Landsborough Thomson's *Britain's Birds and their Nests* (1910).

Wren, SIR CHRISTOPHER, architect, was born at East Knoyle in Wiltshire, on the 20th of October 1632. His father, Dr C. Wren, was Dean of Windsor, and his uncle, Dr M. Wren, was Bishop successively of Hereford, Norwich, and Ely. Young Wren was educated at Westminster School, under the celebrated Dr Busby, and while yet only in his fourteenth year was entered a gentleman-commoner of Wadham College, Oxford. Here he distinguished himself in mathematics, attracted notice by his inventions of certain mathematical instruments, and his enthusiasm in experimental philosophy. In 1650 he took his degree of B.A., and in 1653 that of M.A., having been previously made fellow of All Souls. In 1654 he is spoken of by Evelyn as 'that rare and early prodigy of universal science;' and acquaintance ripened into a firm friendship between Wren and Evelyn.

In 1655 Wren assisted in perfecting the barometer. In 1657 he left Oxford for London, where he became Gresham professor of Astronomy, but in May 1661 returned to Oxford as Savilian professor of Astronomy. The same year he received the degree of D.C.L., and that of LL.D. at Cambridge.

Before leaving London Wren had, in conjunction with Lord Brouncker, the Hon. Robert Boyle, Dr Wilkins, and others, who used to meet together at Gresham College, laid the foundation of the future Royal Society. One of the first proceedings of the Society was to get the king to lay his commands upon Wren to perfect a design he had in hand of a globe of the moon, and to 'proceed in drawing the shapes of little animals as they appear in the microscope.' The lunar globe was finished, much to the satisfaction of his Majesty, who placed it in his cabinet of rarities. He also summoned Wren from Oxford to assist Sir John Denham with his advice on architectural subjects; the poet Denham having been appointed surveyor-general of his Majesty's buildings, but possessing little or no knowledge of the subject.

The study of architecture was one to which Wren had given great attention, notwithstanding his devotion to mathematics, astronomy, chemistry, and even anatomy. In 1663 he was engaged by the Dean and Chapter of St Paul's to make a survey of the cathedral, with a view to certain projected repairs in that vast fabric. He accordingly drew up a very careful and elaborate report, but before any steps were taken St Paul's was irreparably injured by the memorable fire of 1666, and Wren was destined to be the architect of the new cathedral instead of the restorer of the old. The first works actually built from designs by Wren were the chapel at Pembroke College, Cambridge (1663–65), and the Sheldonian Theatre at Oxford (1663–69). In 1664 Wren designed some valuable additions to the buildings at Trinity College, Cambridge, particularly the beautiful western quadrangle known as Nevile's Court. To this he added in 1677–92 the Library of Trinity College, said by Gwilt to be 'one of his finest productions, and one with which he himself was well satisfied.'

In 1665 Wren visited Paris, where he made the acquaintance of Bernini, architect of the colonnade of St Peter's, Rome, and of other distinguished men. The building of the Louvre especially engaged his interest. In the following year he returned, to find the Royal Society earnestly engaged in searching out the causes of the great plague, so soon to be succeeded by the great fire which laid London in ashes. This disaster at once opened a wide field for the exertion of Wren's genius. He formed a plan and drew designs for the entire rebuilding of the metropolis, embracing wide streets, magnificent quays along the banks of the river, and other well-considered improvements. In rebuilding London, however, few of Wren's recommendations were adopted. He was certainly chosen to be the architect of new St Paul's, one of the finest non-Gothic cathedrals in the world; besides which he designed more than fifty other churches in place of those destroyed by the fire. The great church of St Paul, built on the model of St Peter's at Rome, was begun in 1675 and completed in 1710, when the last stone was laid upon the lantern by the architect's son, Christopher.

Besides the numerous churches mentioned, a large number of which have been destroyed, Wren built or designed the Royal Exchange (1667, burnt 1838); Custom-house (1668); Temple Bar (q.v., 1670); the Monument (1671–77); the College of Physicians (1674–98); Drury Lane Theatre (1674, demolished 1791); the Royal Observatory, Greenwich (1675); the Gateway Tower, Christ Church, Oxford (1681–82); Chelsea Hospital (1682–90); Ashmolean Museum, Oxford (1683); part of Hampton Court (q.v., 1690); Morden College, Blackheath (1695); Greenwich Hospital (1696); Buckingham House (1703); Marlborough House (1709); as well as the unfinished palace of Winchester (1683). See RENAISSANCE.

In 1674 Wren received the honour of knighthood. In 1674 he married a daughter of Sir John Coghill, by whom he had a son, Christopher (1675–1747, antiquary); and in 1679 he married a daughter of Viscount Fitzwilliam, by whom he had a son and daughter. In 1680 he was elected President of the Royal Society; in 1684 was made comptroller of the works at Windsor Castle, where he built the state apartments, of which the exterior only was Gothicised by Wyatville; and in 1685 was elected Grand-master of the order of Freemasons. He was also elected a member of parliament for Windsor in 1689, and being unseated on petition was immediately re-elected. In 1698 he was appointed surveyor-general of the repairs at Westminster Abbey. Wren died at his house at Hampton Court, sitting in his chair after dinner, on 25th February 1723, aged ninety years, and was buried in St Paul's Cathedral, where the appropriate inscription, 'Si monumentum requiris, circumspice' marks his tomb. During his declining years he was treated with neglect, and even injustice, by the court of England; 'one Benson' was appointed by George I. to supersede him in the office of surveyor-general; and some private individuals carped at his works in a most malevolent spirit. Steele, however, vindicated the fame of his friend in the *Tatler*, in which Wren is introduced in the character of Nestor; and few have since been found hardy enough to call in question the well-merited reputation of Sir C. Wren as architect, mathematician, and scientific observer.

See *Parentalia, or Memoirs of the Family of the Wrens*, by Sir C. Wren's son and grandson (1750); also Milman's *Annals of St Paul's* (1868), Lives by James Elmes (1852), Miss Phillimore (1881), A. Stratton (1897); W. J. Loftie, *Inigo Jones and Wren* (1893); the *Memorial Volume* of 1923; *Letters of Sir Christopher Wren to Bishop Fell* (concerning 'Tom Tower' at Christ Church, Oxford), edited by W. D. Caröe (1923). In 1924 the Wren Society published its first volume, *St Paul's Cathedral: Original Wren Drawings*.

Wrestling, one of the most ancient forms of athletic exercise, was a favourite pastime of the Greeks when Greece in civilisation, military knowledge, and in the cultivation of arts and sciences led the civilised world. The Olympic Games (see OLYMPIA) included amongst other things contests in wrestling. One of the great objects of the old classical wrestlers was to make every attack with elegance and grace under certain laws of a most intricate nature, and the game is described by Plutarch as the hardest working form of athletics. In Devon and Cornwall wrestling on the catch-hold principle still finds favour. In Lancashire they adopt a catch-as-catch-can style; while in Cumberland and Westmorland the ancient back-hold system continues to hold its own. The Scottish style is a twofold mixture to be hereafter described; and in Ireland collar-and-elbow wrestling is the prevailing fashion. In the United States, Australia, Germany, and Japan the French method is the most popular. This system of ground-wrestling has been dignified—incorrectly, be it said—by the high-sounding title of Græco-Roman wrestling. It consists of a struggle on the ground until one or other of the competitors is compelled through sheer exhaustion to give in; indeed, such a contest is simply an exhibition of brute strength, but, though its introduction into England has done much to bring this ancient pastime into disfavour, promoters of the sport have not succeeded in effecting its elimination. On commencing, the wrestlers take hold from the head and not lower than the waist, when both roll on the ground, and then the actual struggle begins. Tripping, which is the very essence of the game, is not allowed; therefore weight and strength are the only factors in the contest, which terminates when one of the combatants has been placed on both shoulders.

The Cornwall and Devon system is a milder form of entertainment than the foregoing hybrid style. The champions hailing from these two counties wrestle in strong loose linen jackets, and lay hold above the waist or (with restrictions) by any portion of the jacket; and in order to be fairly thrown two shoulders and one hip must be on the ground, or two hips and one shoulder, and a man must be thrown flat on his back before any other portion of his body touches the earth ere a decision can be given against him. Kicking is now forbidden, and the men usually wrestle in their stocking feet, which is a great improvement on the olden method when heavy boots shod with iron were used as a means of attack and defence. The Lancashire fashion allows unlimited action. The competitors are permitted to catch hold where they please, legs included, but they must not scratch or throttle or deliberately injure one another. Here again ground-wrestling becomes a great factor in a struggle for supremacy. In fact, Lancashire wrestling much resembles the Græco-Roman style, though an important difference is its sanctioning of tripping. Two shoulders on the ground constitutes a fall with fifteen minutes' rest between bouts. Though this style has doubtless had the widest influence, the Cumberland and Westmorland method is probably the best-known style, and is still popular in such arenas as those at Carlisle, Grasmere, and other wrestling resorts in the northern counties. In this style both men grasp each other round the body with the left arm above and the right underneath. Neither party is allowed to break his hold until the wrestle is over, and the one who touches the ground first with any part of his body, the feet of course excepted, is deemed the loser. If both fall together it is technically termed a 'dog-fall,' and the men wrestle over again.

In Scottish wrestling a commencement is made by taking hold in the Cumberland and Westmorland fashion with the arms round the body and the hands grasped in the well-known back-hold style. The tussle which ensues frequently lands one of the wrestlers flat on his back, and ends the contest before the struggle on the ground begins. If, however, a fair back-fall, with both shoulders down, does not result, then the bout is continued under Græco-Roman rules. In Ireland the collar-and-elbow style is the 'national' system. It is simplicity itself. The competitors catch hold of the elbow with one hand and the collar with the other, and neither party is allowed to let go his hold till the fall has been gained. It is in some parts called henching, but cannot be considered a satisfactory mode of deciding a contest; yet it is useful in the case of sudden and unexpected attack, as the hold is easily obtained. The Swiss again compete in a special wrestling-costume consisting of drawers, shirt, and a stout belt. A hold can be taken by the drawers alone, the shirt, or the belt, or by all at one and the same time according to the taste of the wrestler. There is no ground-wrestling, and first man down loses in Switzerland, a much to be commended system. The French and Germans have their own fashion, but they so closely resemble the Græco-Roman and Lancashire style that the difference amounts to nothing. To recapitulate the various styles, and the definitions of a fall appertaining to each: Græco-Roman admits ground-wrestling, two shoulders down to constitute a fall. Cornish and Devon, no ground-wrestling, three points down, sometimes four points down as per arrangement. Lancashire ground-wrestling, two shoulders down, any hold. Cumberland and Westmorland, no ground-wrestling, any point down. Scottish, ground-wrestling, two points, or shoulders down. Irish, first down to lose. Swiss, first down to lose. French and German, ground-wrestling, two shoulders down. Indian, one fall, one shoulder-blade down to constitute a fall. In England, the National Amateur Wrestling Association has aided the sport by promoting competitions, while an international federation was formed in 1921. Wrestling is gaining in importance at the periodical Olympic Games, where noteworthy features are the excellence shown by Scandinavian countries and the interest taken in Western wrestling by some Eastern peoples.

Ju-jitsu, a form of Japanese wrestling, is practically a method of self-defence without weapons. Instead of being more or less a trial of mere strength as in English wrestling, it is a question of activity and brains. Advantage is taken of the aggressor's movements, so that as he advances the defender by a deft movement of his foot, leg, or arm, trips him up or renders him helpless. The leading principle is to use the weight and strength of an opponent against himself. A master of the science can by a slight swift motion dislocate a hip or shoulder, break an ankle or arm, and even benumb his opponent's brain. The knack of falling without shock or hurt is an important element in the art. It has become popular in England, and many schools teach it as a healthful athletic exercise.

See Litt's *Wrestliana* (Whitehaven, 1823); Armstrong, *Wrestling* ('All England' series, 1889); Pollock and Grove, *Fencing, Boxing, and Wrestling* (Badminton Library, 1889); H. Leonard, *Handbook of Wrestling* (1897); and books by Cann and Hastings (1912), and Longhurst (1917); also Blackmore's *Clara Vaughan*, for a fine description of a wrestling-match. For Ju-jitsu see W. Bankier ('Apollo'), *Ju-Jitsu, what it really is* (1905); H. I. J. Hancock and K. Higashi, *Complete Kano Jiu-Jitsu* (1905); W. H. Garrud, *The Complete Jujitsuan* (1919).

Wrexham, a town of Denbighshire, called sometimes the 'metropolis of North Wales,' on an affluent of the Dee, 12 miles SSW. of Chester. Its church (destroyed by fire in 1457, rebuilt in 1472–1520, restored in 1866–68) is a fine Perpendicular structure, whose tower, 135 feet high, contains ten bells of singular sweetness, and is one of the 'Seven Wonders of Wales.' Judge Jeffreys was born close by, at Acton; and Bishop Heber wrote 'From Greenland's Icy Mountains' in the vicarage. Wrexham is situated in the heart of a mining district, and has far-famed breweries, tanneries, &c. It was incorporated in 1857, and with Denbigh (q.v.), &c. returned one member to parliament till 1918. Pop. (1851) 6717; (1891) 12,552; (1921) 18,703.

Wright, Joseph, a painter, called commonly 'Wright of Derby,' was born there on 3d September 1734, the third son of 'Equity Wright,' an attorney and town-clerk. He was educated at Derby grammar-school, and at Derby he died on 29th August 1797, having passed his whole life in his native town, with the exception of three and a half years under Hudson in London (1751–54), two years in Italy (1773–75), and two at Bath (1775–77). He married in 1773 Hannah Swift (1749–90), who bore him three sons and three daughters; first exhibited in London in 1765; and was elected an A.R.A. in 1781, an R.A. in 1784—this latter honour he declined. His paintings—of which there was an exhibition at Derby in 1883—are largely portraits or portrait groups, representing not seldom effects of artificial light, as, e.g., in his well-known 'Orrery' (1766) and 'Air-pump' (1768). If inferior to Gainsborough and Reynolds, and to Romney at Romney's best, Wright of Derby stands very high among the English painters of the 18th century, being 'a master of strong effects of light and shade, gifted with fine perception of the powers of local colour,

and something of a poet in landscape.' See the fine folio on him by William Bemrose (1886).

Wright, JOSEPH, philologist, was born at Bradford in 1855, and worked during his youth in a wool-mill. He became deputy-professor of Comparative Philology at Oxford in 1891, and was professor from 1901 till 1925. His many philological writings include part of the translation (5 vols. 1888–97) of Brugmann's *Grundriss der vergleichenden Grammatik, Primer of the Gothic Language* (new ed. 1899), *Middle High German Primer* (1888; new ed. 1917), *The English Dialect Dictionary* (1896–1905), and a number of grammars (English, German, &c.).

Wright, THOMAS, antiquary, was born near Ludlow, Shropshire, 21st August 1810, the son of a Quaker who had migrated from Bradford. From Ludlow grammar-school he proceeded to Trinity College, Cambridge, where he took his B.A. in 1834. He had already contributed to *Fraser's* and other magazines, when in 1836 he went to London, and at once commenced the career of a man of letters. In 1837 he was elected a fellow of the Society of Antiquaries, and in 1838 was one of the two founders of the Camden Society, as in 1843 of the British Archæological Association. He also took an active part in the formation of the Percy and Shakespeare Societies, and for each of these, from time to time, edited volumes. In 1842 he was elected a corresponding member of the French Académie des Inscriptions, and he was also a member of other learned societies on the Continent and in America. He died at Chelsea, 23d December 1877.

From 1836 onwards he published eighty-four works, including, of course, translations and works edited for societies. The following may be mentioned: *Biographia Britannica Literaria* (2 vols. 1842–46); *Essays on the Literature, Popular Superstitions, and History of England in the Middle Ages* (2 vols. 1846); *England under the House of Hanover, Illustrated from the Caricatures of the Day* (2 vols. 1848); *Narratives of Sorcery and Magic* (2 vols. 1851); *History of Ludlow* (1852); *The Celt, the Roman, and the Saxon* (1852); *History of Ireland* (3 vols. 1854); *Wanderings of an Antiquary* (1854); *Dictionary of Obsolete and Provincial English* (2 vols. 1857); *History of France* (3 vols. 1856–62); *Political Poems and Songs, from the Accession of Edward III. to that of Richard III.* (2 vols. 1859–61); *Les Cent Nouvelles Nouvelles* (2 vols. 1858), being a collection of mediæval tales from the only known manuscript of the same, discovered by Wright in the library of the Hunterian Museum, Glasgow; *Essays on Archæological Subjects* (2 vols. 1861); *History of Domestic Manners and Sentiments in England during the Middle Ages* (1861); *A History of Caricature and Grotesque in Literature and Art* (1865); *Womankind in Western Europe* (1869); *Uriconium* (1872; see WROXETER); and *Anglo-Latin Satirical Poets of the Twelfth Century* (2 vols. 1877).

Wright, WILBUR (b. 1867 near Millville, Indiana; d. 1912), and his brother ORVILLE (b. 1871 at Dayton, Ohio), American airplane pioneers, made the first successful flight (260 yards) with a heavier-than-air machine on 17th December 1903 at Kitty Hawk (N.C.), but only after distinguishing themselves in long-distance flights in France (1908) did they win general recognition in the United States. The recipients of numerous distinctions, the brothers Wright founded an aeronautic company, and did much to demonstrate the possibilities of their invention and to add to its technical improvement.

Wrightia. See INDIGO.

Wrist. See HAND; and for Wrist-drop, a form of lead-poisoning, see under LEAD.

Writ, in English law, means a written order addressed to a subject in the king's name. Since the Norman Conquest writs have been freely devised and altered for many different purposes. Some are of an administrative or political nature, as, for example, the writ addressed to a returning-officer, commanding him to hold an election, and return the name of the person elected; writs of mandamus and prohibition, by which inferior courts are kept within the bounds of their jurisdiction; and the famous writ of Habeas Corpus (q.v.), by which a person who has another in custody is commanded to bring up his prisoner and to show by what authority he detains him. An action at law was formerly begun by an 'original writ' issued under the great seal; it is now begun by a writ of summons, requiring the defendant to appear and answer the plaintiff's claim. The judgment of the court is enforced by a writ of execution, as, for example, the writ of Fieri Facias (q.v.), which directs the sheriff to levy the debt by seizing the defendant's goods. See CAPIAS, CERTIORARI, ELEGIT, ERROR, MANDAMUS, NE EXEAT, SUBPŒNA, &c. Formerly the king would issue writs of execution without trial, but this abuse was taken away by the Great Charter of 1215. *De Hæretico Comburendo* was abolished under Charles II. Many of the old forms of writ have been abolished (such as Latitat, which proceeded on the legal fiction that the defendant was in hiding out of Middlesex) or rendered obsolete by modern changes in procedure, such as Scire Facias and Quo Warranto (q.v.). In the United States the several states differ considerably; thus in New York writs of Error and writs Ne Exeat have been abolished. See also SUMMONS and WARRANT.

Writer's Cramp. See CRAMP.

Writers to the Signet, an ancient society of solicitors in Scotland who formerly had the exclusive right to prepare all summonses and other writs pertaining to the supreme court of justice (see SIGNET). Under the 31 and 32 Vict. chap. 101 they have still the exclusive privilege of preparing crown writs, which include all charters, precepts, and writs from the sovereign or prince of Scotland. The office of Keeper of the Signet was in 1817 conjoined with that of Lord Clerk Register. See LIBRARY, p. 630. In England, George Ashby, a poetical successor to Hoccleve, was 'Clerk of the Signet' to Henry VI. and to Queen Margaret. —*Writer* is also a term vaguely applied in Scotland to a law practitioner or his clerk.

Writing, ideographic, syllabic, or alphabetic, is dealt with under ALPHABET, PALÆOGRAPHY, and INSCRIPTIONS, and in the articles on the various letters; while several modes of writing are separately discussed under such heads as CUNEIFORM, HIEROGLYPHICS, OGAM, RUNES, SHORTHAND, VISIBLE SPEECH, and specimens are to be found at ARABIC LANGUAGE, ARMENIA, ETHIOPIC, &c.; so that it is now only necessary to give an account of the materials used for writing, and of the influence of these materials in modifying or transforming the character of the several scripts.

The chief materials on which writings have come down to us are stone, clay, metal, potsherds, wood, papyrus, leather, parchment, wax-tablets, palm-leaves, and paper. The style of the cuneiform inscriptions is due to their having been written on tablets of soft clay, which have then been dried in the sun or kiln-baked. But this cuneiform writing was itself developed out of an earlier lapidary script, the linear Babylonian, so called because it is formed of lines, not wedges, as shown in the undated lapidary inscriptions from Lagash (Telloh), or the inscription of Sargon of Agade, who reigned about 3800 B.C. (see BABYLONIA, Vol. I. p. 639). But when the linear Babylonian had been modified owing to the use of clay, the lapidary inscriptions follow the wedge-shaped forms which arose out of the clay script. The wedge-shaped forms were

impressed on the soft clay by means of a triangular-headed implement.

The oldest inscriptions of Egypt are also engraved on stone; but papyrus was used at an extremely remote period. Hence two styles arose, the hieratic

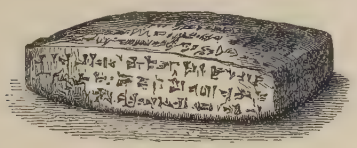


Fig. 1.—A Cuneiform Clay-tablet (reduced).

for papyrus and the hieroglyphic for inscriptions. The *Papyrus Prisse* (see ALPHABET, PALÆOGRAPHY) is written in a bold hieratic hand, bearing little resemblance to the hieroglyphic picture-writing from which it was derived. Such remains of the literature of ancient Egypt as we possess have chiefly come to us on papyrus rolls found in Egyptian tombs. From Egypt the use of papyrus spread to Europe. The oldest Greek records are inscriptions on stone or metal, but we possess Greek papyri found in Egypt which date from the 4th century B.C. At Herculaneum a library consisting of some 2000 carbonised rolls of papyrus was found. It consists mainly of Greek treatises on the Epicurean philosophy, but comprises a few Latin works, among them a poem on the battle of Actium. In the 5th

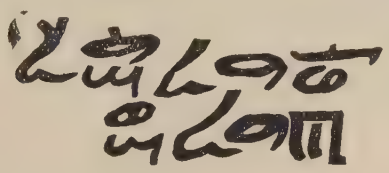


Fig. 2.—Specimen of the Writing of the *Papyrus Prisse*.

century the rescripts of the Imperial Chancery at Constantinople were written on papyrus; we have papyrus deeds from Ravenna dating from the 5th to the 10th century; and in the 7th century papyrus was used for the charters of the Merovingian kings in Gaul. In the 8th century, owing to the Moslem conquest of Egypt, papyrus became more difficult to procure, but it continued to be used in the Papal Chancery till the middle of the 11th century. Concurrently with the use of papyrus for deeds and rescripts, parchment, a more costly material, was largely used for books. As to the date of its invention, Pliny records the legend that Ptolemy V. (205–185 B.C.) prohibited the exportation of papyrus from Egypt, and that in consequence the books in the great library at Pergamus were written on skins specially prepared, called from the place of their origin *pergamena*, from which the word parchment is derived. Leather had previously been used, and is still employed by the Jews for the sacred rolls of the law. Parchment is leather so prepared that both sides can be used to write on. From the 4th to the 16th century parchment, made from the skins of sheep, goats, and calves, was the usual material for books. Vellum is merely a finer kind of parchment made from the skins of younger animals.

Paper (q.v.), made of vegetable fibre or of rags, was probably invented by the Chinese, and introduced into Europe by the Arabs in the 9th century; in the 13th century it was used in France for deeds, and in the 15th century for books. But for the invention of paper, the printing-press would have been an invention of comparatively little importance, papyrus being too frail and parchment too costly for the multiplication of printed books. Professor Clédat remarks that the most considerable happening of the 14th century was the establishment of the fashion of wearing shirts, whereby the manufacture of rag-paper became a possibility.

For ordinary purposes, such as letters, accounts, and the first drafts of books, the Greeks and Romans made use of wooden slabs covered with a thin coating of wax, on which the writing was scratched with a hard point of metal, wood, or ivory, which was called the *graphium* or *stilus*. The other end of the stilus was flattened into a palette, which served to efface the writing or to smooth the wax. These tablets were called *deltoi* by the Greeks, and *tabulæ* by the Romans. They were connected by rings, serving as hinges, and two or more slabs thus connected were called a caudex or codex. A codex of two leaves or slabs was called a diptych, and one of three leaves a triptych. The peculiarities of the Roman cursive hand are largely due to the employment of these wax-tablets. They were used in France till the 13th century, and then superseded by paper.

Papyrus MSS. are, as a rule, written only on one side, and are usually found in the form of cylindrical rolls. Our word 'volume' is derived from the Latin name *volumen*, which was given to these

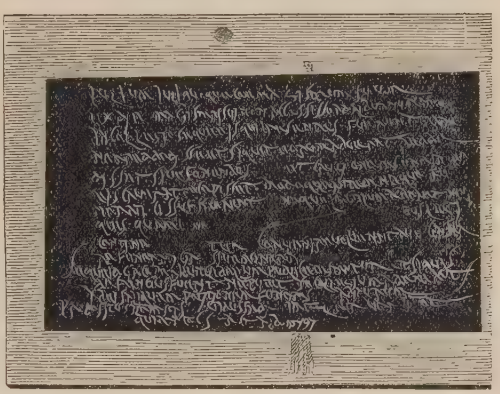


Fig. 3.—Latin Wax-tablet, 2d century (reduced).

rolls. When parchment came into use, we have also the word *rotulus*, whence the name of the Master of the Rolls, who was *custos rotulorum*, the keeper of the rolls or legal documents of the Chancery. When the work was in several rolls the rolls were called *tomoi* (Gr. 'sections'), whence

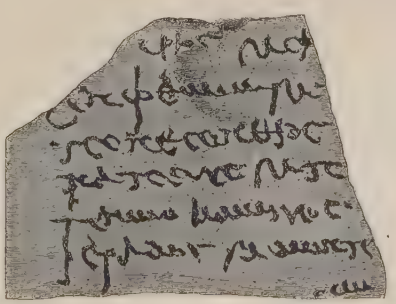


Fig. 4.—Fragment of an Egyptian Ostrakon.

the word 'tome.' The Latin word *liber*, 'a book,' whence our 'library,' points to the use of the bark of trees as the material for writing. 'Book,'

O.E. *bóc*, possibly points to the fact that the runes were cut on slabs of beech-wood, but there are difficulties about this. The book form was adopted for literary works written on parchment, and the name *codex*, originally given to the hinged sets of wax-tablets, was transferred to such MSS., distinguishing them from the *volumina* and *rotuli*. Codices written on papyrus are rare, the material being so fragile that it was liable to tear in turning over the leaves. Before the 15th century MSS. are not paged, but only foliated—i.e. only the leaves or quires, and not the pages, are numbered. Till the 11th century the lines for the writing are scratched with a dry point, in the 13th they are ruled with a plummet or lead point, or with red ink.

In Egypt great numbers of graffiti or inscribed potsherds, called *ostraka* (Gk. 'oyster shells'), have been found. Sometimes the writing is scratched with a sharp point, but is more commonly written in ink with a reed. Some of these *ostraka* are letters or orders to officials, but most usually they are receipts for taxes. The tax-collectors must have gone round with donkeys laden with potsherds in order to give these receipts. We have also Graffiti (q.v.) rudely scribbled on the plaster of Pompeian and Roman walls, which are valuable as disclosing the popular spelling and the cursive hand of the period.

Documents intended for preservation, if not inscribed on stone, were usually engraved on metal. The questions addressed to oracles were scratched on leaden plates, of which great numbers have been found, and leaden plates, containing the name of the deceased, were used as scrolls for *loculi* in tombs. Treaties between Greek states were frequently engraved on bronze plates and affixed to the walls of temples.

ईश्वर इत्थं जगदद्यत यत् स्वमद्वितीयं
तनयं प्रादात यतो यः कश्चित् तस्मिन्
विश्वसिष्यति सोऽविनाश्यः सन् अनन्तायुः
प्राप्स्यति ।

Fig. 5.—St John, iii. 16, in Sanskrit (the Devanagari character), as printed by the British and Foreign Bible Society.

India has yielded seals with a pictographic script of possibly the 3d or 4th millennium B.C. Fourth century coins and the rock inscriptions of Asoka (q.v.), which date from the 3d century B.C., are succeeded by numerous inscriptions from Buddhist caves. The grants of land to temples were commonly engraved on copper plates. But the characteristic Indian material was the palm-leaf, the use of which has profoundly modified the scripts of Southern India, Orissa, Ceylon, and Burma. The palm-leaves were strung together something in the manner of a rosary, by a cord passing through holes bored in the leaves. The Devanagari, or Sanskrit Book-hand (fig. 5), was written on palm-leaves with a reed and ink, but exhibits characteristic forms due to the earlier employment of a dry point, the connecting line from which the letters depend being in this case necessarily absent.

The reed, called *calamus*, *fistula*, *arundo*, or *canna*, cut like a quill-pen, was used for writing with ink on papyrus or parchment. It is still employed in the East, and in the West continued to be used till the 12th century. Isidore of Seville, who wrote in the 7th century, is the first to mention the quill—*penna*, 'a feather,' whence our word 'pen.' In the 13th century the quill had replaced the reed, and the result of the change is seen in the adoption of finer up-strokes. The general use of steel pens has had considerable effect on modern scripts, but metal pens, or calami made of bronze, were not unknown to the ancients. The stylographic pen, before the fountain ousted it, had time to influence handwriting.

Ink was usually black. The oldest inks were thick and glutinous, necessitating the use of a brush, as in the earlier hieratic writing, and in Chinese or square Pali. A thinner ink, suited for the reed, was made from gall-nuts and sulphate of iron (see INK). Red and blue ink were used for titles or initials. From the 6th to the 11th century coloured inks are rare, but in the 12th they become more common. For an account of gold and silver writing on purple parchment, see ILLUMINATION.

Among Indo-Germanic nations the writing is horizontal, and the normal direction from left to right. The Semitic scripts, on the other hand, are written from right to left, as was also early hieratic. Turkish, Afghan, and Hindustani scripts derived from the Arabic retain this direction. The oldest of the Greek inscriptions follow the Phœnician direction, but at an early period they are occasionally written in a snake-like form, following the margin of the stone. In the 6th century, or even earlier, we find them written *boustrophēdon* or plough-wise, the lines running alternately from right to left, and from left to right, just as oxen, when ploughing, draw the alternate furrows in opposite directions. Finally all the lines were written from left to right. The same happened in Italy. The older inscriptions are retrograde, a direction long retained by the Etruscans, while from Cumæ we have boustrophedon inscriptions, until finally the direction from left to right was adopted. The earliest runic inscriptions are likewise retrograde, then they become serpentine or boustrophedon, and finally they are written from left to right. The Himyaritic inscriptions from Arabia Felix are retrograde, boustrophedon, or from left to right, a direction which was adopted when the Himyaritic writing penetrated to India. Hence the Devanagari, the Pali, and all the derived Indian scripts are written from left to right. Chinese is written in vertical columns, beginning with a column on the right-hand side of the paper. The Manchu and Mongolian scripts are also written in vertical columns, but, unlike the Chinese, they begin on the left-hand side of the paper. The Mongolian, from which the Manchu was derived, was obtained from the Syriac script of the Nestorian missionaries, who at first wrote from right to left, and then for convenience wrote vertically, the paper being turned round through 90° to enable it to be read. Finally it was both written and read vertically.

The character and general appearance of scripts has been greatly influenced by the nature of the materials employed, whether stone, clay, metal, wood, papyrus, wax, palm-leaves, parchment, or paper, and also by the implement, whether chisel, brush, reed, stile, or quill, as well as by the quality of the ink. Scripts of wholly different origin, if written with the same materials, acquire a general external resemblance. If a brush, with thick glutinous ink be employed, the writing tends to become upright, thick, and bold, as in Chinese, Siamese, Square Pali, and the hieratic of the old Egyptian empire. If a reed be used the writing often slopes to the left, the up-strokes and down-strokes being of the same thickness, as with a stylographic pen. On the other hand, with a quill or a steel pen the writing slopes to the right, and

the up-strokes are fine. Thus it is manifest that our printed capitals, such as W, M, N, or V, are imitations of quill-written letters, the down-strokes being thicker than the up-strokes. With a lapidary script the strokes are all of the same thickness, the letters are square, angular, upright, and regularly formed, eschewing oval loops or sweeping tails. Thus lapidary Greek and lapidary Himyaritic have a superficial resemblance, though their pedigrees are different. A xylographic script, such as the runic writing, is rectilinear and regular, like a lapidary script, but triangles are preferred to squares, complicated forms disappear, curves and horizontal lines are avoided, diagonals running obliquely across the grain of the wood being preferred. Hence in the runic writing H becomes like our N, the bars of F slope upwards, and R is angular where ours is curved (see RUNES). A palm-leaf script, if scratched with a point, and not written with a reed, prefers arcs of circles and vertical

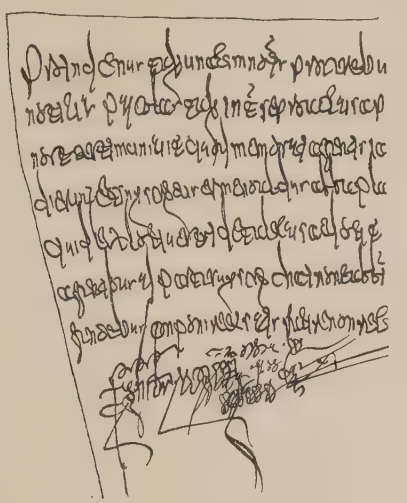


Fig. 6.—Merovingian Script, 7th century. Portion of a Charter of Clovis III. (reduced).

lines, lending itself readily to intricate convolutions, but like a xylographic script it rigorously eschews horizontal lines, which would cause the leaf to split. Palm-leaf scripts, such as those of Orissa, Ceylon, and Burma, have a superficial resemblance, though their pedigrees may differ. On metal, if the writing be punched, it partakes of lapidary forms; if written with a point it becomes scratchy, and we get intersecting lines, the angles are not joined with precision, and circles become irregular ovals. On clay the loops are opened, all the forms are rectilinear, and the strokes become parallel and detached. Books written on parchment, a costly material, exhibit an elaborate caligraphic style, the letters being upright, separately formed, regular in size, with symmetrical curves, elliptical rather than circular curves being preferred. The up-strokes are fine, and the down-strokes of uniform thickness. But if a rough and cheap material, such as papyrus or paper, be employed, the writing tends to become careless and cursive, easily degenerating into an almost illegible scrawl, as in the Merovingian charters, exhibiting blotted loops and elongated tails, the letters being joined by ligatures which have a tendency to modify the forms of the letters. Thus **A** is a lapidary form, *a* is a parchment form, while *a* is a paper form. The same characteristics are exhibited by **M**, m, and *m*; and by most of the other letters.

Assimilation also produces superficial resemblances, especially between contiguous letters, such as E and F, M and N, m and n, p and q. The effects of dissimilation have also to be reckoned with. Thus when r took the form *ɾ* the resemblance to the written *z* became a source of confusion, and the latter letter acquired a tail and became *ȝ*. So the oldest forms of the letters b, d, and *ȓ* r, which consisted of a triangle with a tail, were almost undistinguishable, and, the triangle having become a loop, from a common form resembling P three differentiated forms arose, the letter B acquiring a lower loop, the letter D losing its tail, and the letter R acquiring a second tail, so that B, D, and R are now perfectly distinct.

The history of writing exhibits a constant process of decay and regeneration. Careful book-hands degenerate into illegible cursive scripts, and then new book-hands are gradually developed, which again degenerate. There is a constant struggle between two principles—the principle of least effort, which tends to render writing illegible, and the need of being legible, which tends to regeneration. Thus the beautiful uncial book-hands gave place to the illegible Greek and Roman cursives, and out of these cursives the new minuscules were evolved, which again degenerated into almost illegible cursives. Fashions in writing vary with time and place. Some distinctive national hands are described at PALÆOGRAPHY.

See various works on philology, &c., by W. von Humboldt; Histories of Writing by Wutke (in Ger. 1873), Mason (in Eng. 1920); Beginnings of Writing by Hoffmann (in Eng. 1895), Danzel (in Ger. 1912); E. Johnston, *Writing* (1906); Blackburn and Caddell, *Detection of Forgery* (1909).

Wrongous Imprisonment. See IMPRISONMENT, HABEAS CORPUS.

Wroxeter, a village of Shropshire, on the Severn, 6 miles SE. of Shrewsbury. It occupies the site of the Roman *Uriconium* or *Viriconium*, an important station on Watling Street, where part of the wall (once 3 miles in circumference) with ditch and rampart still exists; many and various Roman remains have been excavated here. Wroxeter church has a Saxon nave and late 12th-century chancel. See Wright's *Uriconium* (1872); the 'Victoria History' of Shropshire; and Bushe-Fox, *Excavations* (1913–14).

Wryneck (*Iynx*), a genus of birds of the Woodpecker family (Picidæ), having a short, straight, conical beak; a long extensile tongue,

Wryneck (*Iynx torquilla*).

with a horny point; wings of moderate size; a rather short and rounded tail; the feet with two toes in front, and two behind. One species, the Common Wryneck (*I. torquilla*), is a regular spring visitor to England and the north of Europe. From its appearing at the same time with the

cuckoo, it has acquired the name of *Cuckoo's Mate*, or *Cuckoo's Leader*. It has been found as far north as Caithness, the Orkneys and Shetlands, and the Faeroes. It has also been found in Ireland. It is about 7 inches long, of a rusty ash colour, irregularly spotted with brown and black. It feeds on caterpillars and insects, and is often seen on the ground near ant-hills, feeding on the ants and their 'eggs.' The construction of its tongue resembles that of woodpeckers, and enables it to seize its insect prey with wonderful celerity; the tongue, which is covered with a glutinous secretion, is darted out and retracted so that the eye can scarcely follow it, the two posterior branches of the bones of the tongue being much elongated, and muscles for its extension attached to them. The wryneck generally makes almost no nest, but deposits its eggs on fragments of decayed wood in a hole of a tree. The young birds are easily tamed, and are great favourites with boys. In France boys tie a string to one of the legs of the bird, and allow it to climb trees in search of insects. The name wryneck is derived from the bird's habit of writhing its head and neck quickly in various directions, with an undulating snake-like motion, which it does particularly if found in its hole in a tree, making at the same time a hissing noise, to alarm the intruder; but on his drawing back it suddenly darts out and escapes.

Wu-chang. See HANKOW.

Wudwan. See WADHWÁN.

Wu-hu, a Chinese treaty port in An-hui, near the Yang-tsze, 50 miles above Nanking; pop. 122,000.

Wülker, or WÜLCKER, RICHARD PAUL (1845–1910), philologist, was born at Frankfort-on-the-Main, studied at Berlin, Leipzig, and Marburg, and in 1875 was appointed professor of English at Leipzig. His works include *Altenglisches Lesebuch* (1874–88), *Grundriss zur Geschichte der angelsächsischen Litteratur* (1885), *Geschichte der englischen Litteratur* (1896; new ed. 1906–7). He re-edited Grein's *Bibliothek* (of Old English prose and verse).

Wullenwever. See LÜBECK.

Wulstan, or WULFSTAN, (1) a monk of Winchester in the 10th century, author of a Latin prose life of Bishop Ethelwold, and a poem in Latin hexameters on the Miracles of St Swithin.—(2) An Archbishop of York, in 1003, author of two pastoral letters and several homilies in Old English, the most remarkable of which is printed in Hickes's *Thesaurus*, vol. iii. See *Ueber die Werke des altengl. Erzbischofs Wulfstan* (Weimar, 1882), by Prof. A. Napier, who also edited the Homilies (Berlin, 1883).—(3) The well-known Bishop of Worcester, and a saint of the English calendar. He was born at Icentun in Warwickshire about 1007, and educated at Evesham and Peterborough. He became a priest, afterwards a monk and prior of the monastery of Worcester, and ultimately in 1062 bishop of that see. He lived through the troubles of the Norman Conquest, enjoyed the favour not only of the Conqueror, but of William Rufus, and died in 1095, at the age of eighty-seven. He is by some reputed the author of the portion of the Anglo-Saxon Chronicle which extends from 1034 to the death of the Conqueror. His Life was written by William of Malmesbury (Wharton's *Anglia Sacra*, vol. ii.). See Jost in *Anglia* (1923).

Wundt, WILHELM MAX, physiologist and philosopher, was born 16th August 1832 at Neckarau in Baden, and, after lecturing at Heidelberg and Zürich, went to Leipzig in 1875 as professor of Physiology. He was distinguished in the field of experimental psychology, and wrote a long series of works on the nerves and the senses, the relations of physiology and psychology, folk-psychology, philosophy, logic, ethics, &c. He died 1st September 1920. Many of his works have been translated into English.

Wupper, or WIPPER, a tributary of the Rhine, which enters on the right bank between Cologne and Düsseldorf. The river, about 40 miles in length, has a strong current, and is used as motive power by hundreds of mills, so that the Wuppertal, especially that part of it which contains the towns of Barmen (q.v.) and Elberfeld (q.v.), is one of the most populous and industrial in Germany. The religious zeal of the inhabitants, and their interest in missions, are conspicuous.

Württemberg, a republican state of Germany, lying between Baden on the west and Bavaria on the east, and touching Switzerland (Lake of Constance) on the south. It entirely surrounds Hohenzollern, within which, as well as in Baden, it owns several detached portions of territory. Area, 7534 sq. m. (a little larger than Wales); pop., which is nearly stationary, 2,579,453 in 1925. Chief town, Stuttgart (q.v.); Ulm, Heilbronn, Esslingen, and Reutlingen have 30,000 to 57,000 inhabitants. The Black Forest, rising to 3776 feet, lies along its western boundary; whilst the Swabian Alb (3327 feet) stretches right across the country from west to east, forming the watershed between the Neckar and the Danube, the principal rivers of the land; the northern portions belong to the Bavarian plateau. Mineral springs are plentiful. The numerous fertile valleys, favoured by a genial and temperate climate, produce cereals, wine, and fruit in abundance, while the breeding of live-stock is of some importance. Forests occupy about a third of the area. Iron, salt, and turf are extracted. The industries are varied and extensive, the more notable branches being gold and silver work, hardware, iron-casting, machinery, philosophical and musical instruments, clocks, bricks, chemicals, toys, printing and publishing, paper, tanning, brewing, silk and wool spinning, embroidery, &c. The country has for many ages been noted for its high educational standard. The national university is at Tübingen; Stuttgart is the seat of an excellent polytechnic, Hohenheim of an agricultural academy. Of the total population two-thirds are Protestants. The People's Republic (Volksstaat) was proclaimed in November 1918. The Constitution of 1919 places the supreme power in the hands of a Landtag of eighty members elected for four years by universal suffrage. The Landtag appoints the state president, who acts as head of the government. Famous Württembergers were Schiller, Uhland, Wieland, Hauff, Kerner Œcolampadius, Schelling, Hegel, Baur, D. F. Strauss, Kepler, Dannecker, Einstein.

Württemberg, then occupied by the Suevi, was conquered in the 1st century by the Romans. In the 3d century it was overrun by the Alemanni, who in their turn were subdued by the Franks. The Frankish emperors included part of their territories in the Duchy of Swabia, and eventually, in or before the 13th century, conferred upon a local family the dignity of Counts of Württemberg. Count Eberhard the Illustrious (1279–1325) greatly extended the possessions and power of the family, and made Stuttgart his principal residence. Eberhard II. (1344–92) waged a long and finally successful feud against the towns of the Swabian league. From 1442 to 1482 the county was divided between two branches of the family; but in 1495 Count Eberhard V. (1480–96) was created a duke of the empire. Ulrich (1498–1552), who began to rule when only sixteen, is perhaps the best known of the dukes: his extravagance and love of display occasioned the 'Poor Conrad' peasant revolt (1514); he caused Ulrich von Hutten's cousin

to be slain, whereby he roused a host of enemies —the knightly orders of the empire, the Bavarian dukes, the towns of the Swabian league, and the emperor. The ban of the empire being proclaimed against him, he was driven into exile. On his return he introduced the Reformation into his duchy; and the policy thus begun was energetically furthered by Ulrich's son Christopher (1550–68), who was likewise the author of important legislative reforms. During 1547–99 Württemberg was constrained to rank as a fief of the Austrian house. Though it took no direct part in the Thirty Years' War until 1634, the country suffered very greatly from the various hostile armies, especially the Imperialists, and it took all the energy and statecraft of Duke Eberhard III. (1628–74) to repair the damages and recuperate the resources of his country. Under Eberhard Ludwig (1677–1733) the French, in repeated invasions, helped the mistresses of the extravagant duke to impoverish the land anew; nor did his cousin and successor do anything to improve its condition. Karl Eugen (1737–93), the next duke, aped Louis XIV., built castles, waged war against Frederick the Great, violated the constitution by arbitrary acts, but did much in his later years to foster education and science. Frederick II. (1797–1816) brought upon himself the vengeance of Moreau in 1800, but on going over to the French was rewarded with 850 sq. m. of new territory and an addition of 125,000 subjects, as well as the dignity of Elector. In the war that Napoleon began against Austria in 1805 the Elector of Württemberg threw in his lot with the French, and his troops fought on that side down to 1813; in return for which he acquired the kingly title and an increase of territory that more than doubled the number of his subjects. The reign of the next sovereign, King William I. (1816–64), was chiefly occupied with the reorganisation of the new state and in the political conflicts that grew out of the democratic movement of 1848. Throwing in her lot with Austria in 1866, Württemberg was beaten at Tauberbischofsheim, and had to pay Prussia an indemnity of £800,000. Yet in 1870 the country maintained the German cause against France, its troops fought bravely alongside the Prussians, and in 1871 Württemberg (retaining some privileges) became part of the German empire. King Charles (1864–91) was succeeded by William II. In November 1918 a Volksstaat was proclaimed, and Wilhelm Blos elected president (March 1919).

There are Histories of Württemberg in German by Stälin (1882–87), Weller (1916), Egelhaaf (1922).

Wurtz, CHARLES ADOLPHE (1817–84), a great French chemist, was the son of the Lutheran pastor of a village near Strasburg, studied there and at Giessen, and became professor of Organic Chemistry at the Sorbonne and of Toxicology at the Paris School of Medicine. He discovered the ammoniac compounds, glycol, and aldol, fixed the atomic relations of organic compounds, and wrote largely, including great works on the atomic theory and on chemical philosophy, and a dictionary of chemistry.

Würzburg, capital of the Bavarian province of Lower Franconia, in a beautiful valley on both sides of the Main, 70 miles SE. of Frankfurt by rail. Among the public buildings are the magnificent Episcopal Palace (1720–44) and the spacious and excellently fitted-up Julius hospital (1576), the university buildings, the town-hall, &c. The fortress of Marienberg, built on the site where Drusus founded a castle, is situated on a hill 400 feet high, on the left bank of the Main, and was till 1720 the episcopal residence. Of the numerous churches the most worthy of notice are the richly decorated cathedral, which was rebuilt in the 11th and following centuries, with beautiful chapels and monuments of the bishops; the Marien-kapelle, one of the most beautiful monuments of old German art, with fourteen statues of the 15th century; the university church; and the Neumünster Church, containing the bones of the Irish patron saint of Würzburg, St Kilian, and of Walther von der Vogelweide. In front of the Julius hospital there is a bronze statue of the founder, Bishop Julius, who also in 1582 founded the university (an older one dating from 1403 having had but a short existence). The hospital was put in connection with the university, which has all along kept the medical faculty in high reputation, and promoted the prosperity of the university as a whole. There are also libraries, museums, and various educational institutions. There are manufactures of tobacco, furniture, machinery, surgical and scientific instruments, railway carriages, vinegar, wine, beer, and iron. Pop. (1880) 51,014; (1925) 89,910.

Würzburg (Lat. *Wirceburgum*) was long the capital of a sovereign bishopric of the German empire, founded in 741 by St Boniface, whose bishops held the title of Dukes of Franconia, though in spiritual matters they were under the Archbishop of Mainz. The area of the bishopric was upwards of 1800 sq. m., with a pop. of 250,000. At the peace of Lunéville (1801) the bishopric, like the other spiritual principalities of Germany, was secularised; and in 1803 the greater part of it was conferred on the Elector of Bavaria. In 1805 Bavaria gave up Würzburg to the Grand-duke Ferdinand of Tuscany, and the principality was raised to the dignity of an electorate. But at the Vienna Congress it reverted to Bavaria. The campaign of the Prussian army of the Main ended with an action here in 1866, the fortress being bombarded; and since then Würzburg no longer ranks as a fortified place. See Abert, *Aus Würzburg's Vergangenheit* (1922).

Wurzen, a town of Saxony, on the Mulde, 18 miles E. of Leipzig by rail, with a 12th-century cathedral, an old castle, and manufactures of biscuits, carpets, felt, cigars, wire, &c. Pop. (1925) 18,265.

Wuttke, HEINRICH, historian, born at Brieg in Silesia, February 12, 1818, became professor at Leipzig in 1848. He also took an active interest in politics, and had to the last a bitter enmity to Prussia. He died at Leipzig, 14th June 1876. Besides books devoted to the history of Silesia (1842–43, and 1847), the three years of war, 1756–58 (1856), Poland and Germany (1847), the battle of Leipzig (1863), William of Orange (1864), he began a great work on the history of writing, of which unhappily he only lived to publish the first volume, *Entstehung der Schrift* (1872). In 1879 appeared *Zur Vorgeschichte der Bartholomäusnacht.*

Wuttke, KARL FRIEDRICH ADOLF (1819–70), theologian, was born at Breslau, became professor at Berlin (1854) and at Halle (1861). His chief work is his *Christian Ethics* (1860–62; trans. New York, 1873). He was orthodox and high conservative, and wrote also a history of heathenism (1853) and a book on modern superstitions (1865).

Wyandots, a tribe of American Indians, related to the Iroquois, by whom they were nearly exterminated, the remnant emigrating to the country around Lake Superior. They furnished 400 warriors to the English in 1812, afterwards settled in Ohio, and in 1832 removed to Kansas.

Wyandotte, a city of Michigan, 12 miles SW. of Detroit, with salt works and factories; pop. 14,000.

Wyandotte Cave, a vast cavern in Indiana, near the southern border, is next in size to the

Mammoth Cave, which it excels in the multitude and magnificence of its stalactites and stalagmites. One apartment is 356 feet long by 250 high; one branch is 20 miles in length.

Wyatt, JAMES, architect, was born at Burton Constable, Staffordshire, in 1748, studied in Rome, and succeeded Sir W. Chambers in 1796 as surveyor to the Board of Works. He built the fantastic pile of Fonthill Abbey for Beckford, and was killed near Marlborough by a carriage accident, 4th Sept. 1813.

Wyatt, SIR MATHEW DIGBY, architect, was born in 1820 at Rowde near Devizes. After studying at the Royal Academy, he made a diligent study of the architecture of Italy, France, and Germany, returning to England in 1846 to publish his *Geometrical Mosaics of the Middle Ages* (1848). As secretary to the Royal Commissioners he took an important part in the arrangements of the 1851 Exhibition. In 1856 he was appointed architect to the East India Company, in 1866 awarded the royal gold medal of the Royal Institute of British Architects, and in 1869 knighted and chosen Slade professor of Fine Arts at Cambridge. He died 21st May 1877.

His chief books are *Metal Work and its Artistic Design* (1852), *Industrial Arts of the Nineteenth Century* (1853), *Art Treasures of the United Kingdom* (1857), *Fine Art* (1870), *Architect's Handbook in Spain* (1872).

Wyatt, RICHARD, sculptor, born in London 3d May 1795, became pupil of Charles Rossi, was afterwards a student of the Royal Academy. next studied at Paris under Bosio, and in 1821 went to Rome to the studio of Canova, where Gibson was a fellow-student, and where he died, 29th May 1850. His favourite subjects were classical and poetical. His figures always show excellent modelling, especially his female figures, whose grace and beauty are beyond all praise.

Wyatt, SIR THOMAS, courtier and poet, was born in 1503 at Allington Castle in Kent, son of Sir Henry Wyatt, who stood high in favour with Henry VII., and later with his son. In 1515 he was entered at St John's College, Cambridge, where in due time he took his degrees of Bachelor and Master of Arts. He was warmly received at court, for he was one of the most accomplished men of his day, of a noble presence and fine manners, dexterous and subtle in the management of affairs, yet of spotless honour and integrity. In 1536 he was knighted, and the next year he was made high sheriff of Kent. He contrived to retain the hazardous favour of the king, and was frequently employed by him in positions of trust, as in missions to Spain, to the imperial court. In 1541 he was rewarded with a grant of lands at Lambeth, and the year after he was named high steward of the king's manor at Maidstone. He had now very much withdrawn himself from public life, and lived for the most part retired at Allington. On the 11th October 1542 he died of fever at Sherborne. Among the other accomplishments of Wyatt was that of verse, which he seems to have begun to cultivate early, and continued through life to practise. During his life he had acquired considerable reputation as a poet; and in 1557 his poems, along with those of Surrey, were published in *Tottel's Miscellany* (ed. by Arber, 1870). As marking a stage in the progress of our early literature they hold a permanent place. His love poetry is somewhat overrun with conceits derived from the study of Italian models; but some of the shorter pieces are models of grace and elegance. His satires also possess considerable merit.

His poems, with Surrey's, were edited by Dr G. F. Nott (2 vols. 4to, 1815–16). See also Arber's introduction to the *Songes and Sonettes* (1870); the complete variorum edition by Miss A. K. Foxwell (2 vols. 1913); studies by Alscher (Vienna, 1886), Simonds (Boston, 1889), and Miss Foxwell (1911). The name is also spelt Wyat, Wiat.

Wyatt, SIR THOMAS, surnamed the Younger, to distinguish him from the preceding, of whom he was the only son, was born about 1520. After a wild and riotous youth, he raised a body of men at his own expense, and did good service at the siege of Landrecies (1544), displaying considerable military talent; and he continued in honourable service on the Continent till 1550. In 1554, when the Spanish match was in agitation, Wyatt, in co-operation with Lady Jane Grey's father, led the Kentish men to Southwark, after gaining considerable successes; but failing to capture Ludgate, he became separated from the main body of his followers, and was taken prisoner, and soon after executed, 11th April 1554.

Wyborg. See VIBORG.

Wych Elm. See ELM; also WITCH-HAZEL.

Wycherley, WILLIAM, was the eldest son of Daniel Wycherley, a Shropshire gentleman of good family and some property, and was born in the village of Clive, near Shrewsbury, in 1640. When about 15 years of age he was sent to France, where he was admitted to the circle of the Précieuses of which the celebrated Duchesse de Montausier, the beautiful daughter of Madame de Rambouillet, was queen. The duchess is said to have gained over young Wycherley to the Roman Catholic faith, but on returning to England in 1660 and becoming a fellow-commoner of Queen's College, Oxford, he was reconverted to Protestantism by Dr (afterwards Bishop) Barlow. He left college the same year without taking a degree and entered at the Inner Temple, where he acquired as much legal knowledge as sufficed for the happy portrayal of a litigious widow in his comedy of *The Plain Dealer*. For some years he lived gaily as a man about town and a courtier; a burlesque poem, *Hero and Leander*, appeared (probably) in 1669, and he began early to work as a dramatic author, but the dates at which his comedies were written are uncertain. 'The chronology of Wycherley's plays,' says Pope, 'I am well acquainted with, for he told it me over and over. *Love in a Wood* he wrote when he was but nineteen; *The Gentleman Dancing-master* at twenty-one; *The Plain Dealer* at twenty-five; and *The Country Wife* at one- or two-and-thirty.' If this statement be correct, the plays must have been written about the years 1659, 1661, 1665, and 1671. They abound, however, in allusions which could not possibly have been made in these years, and they must either have been in a great measure rewritten after the dates given by Pope, or more probably Pope was in error regarding them. The question, however, is one of no great moment. *Love in a Wood, or St James's Park*, a brisk comedy of hide-and-seek, was acted with much applause in 1671, and its handsome witty author became for a time one of the most popular men in town. He rose into special favour with 'her graceless grace,' the Duchess of Cleveland, with the Duke of Buckingham, and with the king. The duchess, according to Voltaire, used to visit him in his chambers at the Temple, 'dressed like a country-maid, in a straw hat, with pattens on, and a box or basket in her hand' (though this tradition has been doubted). Buckingham gave him a commission in a regiment; and Charles went to see him while he lay fever-stricken in Bow Street, made him a present of £500, with which the poet was able to visit Montpellier, and at one time wished to appoint him tutor to his son, the Duke of Richmond. Wycherley served for a short time in the fleet, like Dorset and many other young men of rank and fashion of that day, and was present at a sea-fight which may have been the battle gained by the Duke of York

over Opdam in 1665, but was more probably one of the drawn battles fought between Rupert and De Ruyter in 1673. *The Gentleman Dancing-master*, a cleverly constructed farcical comedy of intrigue, was produced at the end of 1671 or at the beginning of 1672. *The Country Wife*, Wycherley's coarsest but strongest play, partly founded on Molière's *L'École des Maris* and *L'École des Femmes*, was brought out in 1673, and was followed in 1674 or 1676 by *The Plain Dealer*, founded partly on Molière's *Misanthrope*. In 1679 or 1680 Wycherley married the Countess of Drogheda, a young and handsome widow, with whom he lived unhappily, though his wife appears to have been sincerely attached to him. At her death in 1681, she left him all her fortune, a bequest which involved him in a law-suit whereby he was reduced to poverty and then cast into the Fleet prison. There the ex-favourite of Charles remained for some years, while his comedies were being repeatedly performed to delighted audiences. At last James II. happened to witness a representation of *The Plain Dealer*, and was so impressed by the character of the hero, the surly sea-captain, Manly, that he set free the author by paying his debts, and awarded him a pension of £200 a year. At the age of sixty-four Wycherley published a folio of *Miscellany Poems*, and also made the acquaintance of Pope, then a youth of sixteen, who for a time paid court to him assiduously, and to whom he entrusted the revision of a number of his verses. Pope set about the task in a manner better calculated to improve the lines than gratify their author, the natural result being a quarrel, followed by expressions of esteem on both sides, but by no renewal of intimacy. Pope published his correspondence with Wycherley (in a garbled form), together with some posthumous works, first in 1729. Wycherley's money troubles continued to the end of his days, even his succession to his estate failing to set him completely free. At the age of seventy-five he married a young woman, in order to balk the hopes of his heir, a nephew whom he disliked, by burdening the estate with a jointure. Eleven days after his marriage he died, 31st December 1715, and was buried in the vault of Covent Garden church. According to Pope, he died in the Roman Catholic faith. Leigh Hunt was very probably right in saying that Wycherley was a better man that he seems in his printed works. In his lifetime he was highly spoken of for his sincerity and goodness of heart, and was known among his associates as 'Manly Wycherley'—a title of which he certainly showed himself worthy by his courageous adherence to the Duke of Buckingham when that noble had fallen into disgrace with the king.

Few writers have been at once so unsparingly condemned and so highly praised as Wycherley. Macaulay pronounced him worthless alike as a man and as a dramatist—Wycherley it must be remembered was a pensioner of James II.—while Sir Walter Scott praised his 'strong and forcible painting,' set his *Plain Dealer* in some respects above Molière's *Misanthrope*, and declared that he stood aloof from the other dramatists of the Restoration in that he upheld the standard of the Jonsonian school. *The Way of the World*, says Swinburne, is one of the glories, *The Country Wife*, one of the disgraces of English literature. *The Country Wife*, says Hazlitt, will do its author never-ceasing honour. The play, in truth, excites alternate admiration and disgust. The hero is an outrage at once on decency and probability, but the heroine is a triumph. In literary brilliance Congreve of course infinitely outshines Wycherley, but Wycherley is a far more dexterous playwright. He does not sacrifice action to epigram, he never confounds the closet with the stage. There are scenes in *The Country Wife* where it would be hard to overpraise the ingenious, startling turns of the plot, the natural evolution of the situations, the irresistible bustle and rattle of the action. Wycherley's style is vigorous and pointed, though it lacks the raciness of Vanbrugh's and the ease and dash of Farquhar's, no less than the exquisite modish grace of Congreve's. There is a curious strain of inconsistency in his work which marks it off from the work of the other Restoration dramatists. If he sins more grossly alike against morality and art than Congreve or Vanbrugh or Farquhar, his work nevertheless betrays an earnestness of purpose, a sincere and even morose indignation against certain forms of vice, of which there is no sign in all their graceless, sparkling revel of raillery and intrigue. No one, says Hazlitt, could read his *Plain Dealer* without being the better for it through life. Wycherley's poems have very little merit. He is a writer whom it is very difficult to judge fairly; but to brush him aside as a mere worn-out example of the depraved dramatic taste of a day is to show either that one has no first-hand knowledge of his work, or that one is blind to admirable stagecraft and skilful characterisation, to the sparkle of genuine wit and the play of genuine humour, though the wit is often hard and deliberate and the humour often coarse and cold.

See Leigh Hunt's edition of Wycherley, Congreve, Vanbrugh, and Farquhar (new ed. 1865); Klette, *Wycherley's Leben und dramatische Werke* (1883); Ward's edition of Wycherley (1888); G. B. Churchill's of *The Country Wife and The Plain Dealer* (1924); Montague Summers's edition of the *Complete Works* (3 vols. 1924); Hazlitt's *English Comic Writers;* Ward's *English Dramatic Literature* (new ed. 1899); Charles Perromat's *William Wycherley: sa vie, son œuvre* (Paris, 1921).

Wycliffe, JOHN (whose family name is also spelt *Wyclif*, *Wiclif*, *Wickliffe*, and in some thirty other ways), is believed to have sprung from a family which held the manor of Wycliffe on Tees, and to have been born at Hipswell, near Richmond, Yorkshire, about 1320. Of his early life we know nothing, except that he distinguished himself at Oxford, where he was a popular teacher. The first authentic mention of his name is in 1360, when he was master of Balliol College. He resigned the mastership soon afterwards on taking the college living of Fillingham. This he exchanged in 1368 for Ludgershall, Buckinghamshire, probably to be nearer Oxford, where his chief interests centred. Meanwhile he had for a short time held the wardenship of Canterbury Hall, having been appointed by Archbishop Islip, and deprived by Islip's successor, Simon Langham. These changes involved the question whether the hall should belong to monks or to secular priests, and Wycliffe attempted to defend his position, but after three years' litigation the papal court decided against him.

Wycliffe was already known beyond the university, and held some office, probably that of royal chaplain, at court, where he was consulted by the government, and occasionally employed as a pamphleteer. Thus on one occasion we find him defending the refusal of tribute demanded by the pope, and on another writing an apology for John of Gaunt as to infringement of the right of sanctuary in Westminster Abbey. In 1374 he was presented by the crown to the rectory of Lutterworth (q.v.), and later in the same year was sent as a commissioner to Bruges to treat with ambassadors from the pope concerning provisions and reservations of ecclesiastical benefices, abuses that caused much indignation in England. Wycliffe was no doubt chosen as a recognised opponent of papal intrusion, but less zealous colleagues were associated with him, and nothing of importance was accomplished. On

his return he was appointed to a prebend at Westbury, which he at once resigned, probably because he could not consistently hold such preferment.

The next years were full of strenuous activity, which gained him support among the nobles and the London citizens. As yet the chief error charged against him was his maintenance of a right in the secular power to control the clergy and even to withdraw endowments. Meanwhile a party among the nobility, headed by the Duke of Lancaster, was endeavouring to exclude churchmen from the great offices of state which they had been accustomed to hold. The resentment of the bishops showed itself in a summons to Wycliffe to appear before the archbishop in St Paul's, on 19th February 1377. He obeyed, but before the council could get to business it was broken up by an unseemly quarrel between the Bishop of London and the Duke of Lancaster. The pope now took the matter in hand, and in May addressed a series of bulls to the king, the bishops, and the university of Oxford, bidding them to imprison Wycliffe and make him answer before the archbishop and the pope. It was several months before any attempt was made to obey the pope's commands, and when at last some half-hearted proceedings were undertaken, they were interrupted by a mob and put an end to by an order from the young king's mother. The prosecution had little effect upon Wycliffe's position, for while it was going on he was consulted by the Great Council as to the right of forbidding the papal agents to take money out of the realm. The odd alliance between Wycliffe and the Duke of Lancaster sprang almost entirely from their opposition (from different motives) to the hierarchical system, and the interference of the clergy in politics.

The whole fabric of the church was now (1378) shaken by the election of a second pope; the spiritual allegiance of Europe was divided, and the shock was increased by the scandalous methods to which the rivals resorted in their strife. The schism affected Wycliffe deeply. Hitherto he had attacked the manifest abuses in the church, but he now began to strike at its constitution, and declared that it would be better without pope or prelates. He denied the priestly power of absolution, and the whole system of enforced confession, of penances, and indulgence, that was bound up with it. Up to this time his controversial works had been written in Latin, and couched in the scholastic forms of which he was a master; he now appealed to the people in their own language, and began to issue the series of popular tracts which gained him the distinction of being the first writer of English prose. He organised a body of itinerant preachers, his 'poor priests,' who spread his doctrines widely through the country, and, most important of all, he began his translation of the Bible, of which as yet there was no complete English version. The work seems to have been carried through rapidly with the aid of his disciples, and was extensively circulated. See BIBLE (TRANSLATIONS OF).

Thus far his novel views had met with much acceptance both among the gentry and the people, but he entered upon more dangerous ground when in 1380 he assailed the central dogma of transubstantiation. A convocation of doctors, called together by the chancellor of Oxford, condemned his theses and forbade him to maintain them in the university. He refused to obey, and appealed to the king, but the court was not prepared to defend formal heresy. In 1382 Archbishop Courtenay convoked a council at the Blackfriars' Convent and condemned Wycliffite opinions as represented in twenty-four theses. Wycliffe's followers were arrested, and after some time were all compelled to recant. For some unknown reason Wycliffe was not judged. He withdrew from Oxford to Lutterworth, where, in spite of a stroke of paralysis, he continued his incessant literary activity. His work in the next two years, uncompromising in tone, is astonishing in quantity, and shows no falling off in power, but on the 28th December 1384 he was again struck with paralysis, and died on the 31st. He had received a summons to appear before the pope, but had excused himself mainly on the ground of ill-health.

The characteristic of Wycliffe's teaching was its insistance on inward religion in opposition to the formalism of the time. As a rule he attacked the established practices of the church only so far as he thought they had degenerated into mere formal or mechanical uses. Thus he admits that confession may commonly be useful, and that in such cases it is a duty to resort to it, but maintains that it is a matter that rests with a man's conscience. The law which enforced confession once a year made it, he thought, a matter of form, and gave an opportunity of mischief to bad or incompetent priests. He allowed the use of images as an incentive to devotion, but denounced as idolatrous any regard for the image itself. In like manner he maintained the duty of receiving all the ordinances prescribed by the church, while saying that under special conditions they may be dispensed with, as 'God is not bound by sensible sacraments.' He laid stress on the direct relation between God and man, and consequently denied the mediating power of the priest. No man can be excommunicated, 'unless he were first excommunicated by himself.' There has been much misapprehension of his celebrated doctrine of 'dominion as founded in grace.' According to this no one has true dominion over anything unless he is in a state of grace. This has been supposed to mean that the truly religious have a right to seize all possessions, and has been naturally scouted as subversive of society. But with Wycliffe the doctrine was purely ideal. Lordship, he says, has nothing to do with civil possession, but in the truest sense everything belongs to him for whom all things work together for good, while the wicked has no real lordship over possessions that only help him to final condemnation. The practical value of the doctrine lay in its appeal to the conscience; by an analogy with the feudal law he tried to bring home to every one his responsibility to God as his chief lord. Of the personal appearance and demeanour of Wycliffe we know little, and his portraits cannot be relied on as authentic. We are told that he was thin and worn, and that he added to wide accomplishments a charm of manner which won the regard of all with whom he had to do. His bitterest opponents had no charge to bring against his character, and his courage is shown by the frankness with which in his latest writings he maintained his opinions, although they had been publicly condemned. The influence of his teaching was wide-spread in England, though much of the contemporary opposition to the Papacy was on political and not religious grounds. Reform was desired, but the fundamental doctrines were rarely questioned. Huss (q.v.) avowed himself an admirer and pupil of Wycliffe, large parts of whose works he adapted and published as his own, while Luther himself admitted how much he owed to the Bohemian reformer. Thirty years after Wycliffe's death forty-five articles extracted from his writings were condemned as heretical by the Council of Constance, which ordered the bones of the heretic to be dug up and burned, a sentence executed thirteen years later.

BIBLIOGRAPHY.—Wycliffe's Bible (two versions in parallel columns, 1850); Select English works (3 vols. 1869-71); *English Works hitherto Unprinted* (1880); Latin works (Wyclif Soc. 1882 *et seq.*) See, besides

earlier Lives by Lewis (1723) and Vaughan (1828), *John Wycliffe and his English Precursors*, by Lechler (trans. by Lorimer, 1884), R. L. Poole's *Wycliffe and Movements for Reform* (1889), Loserth's *Wyclif and Hus* (1884), L. Sergeant's study (1892), G. M. Trevelyan's *Age of Wycliffe* (1899), H. B. Workman's *John Wyclif* (1926), and works cited at LOLLARDS.

Wycombe, HIGH, officially CHEPPING WYCOMBE, a municipal borough of Buckinghamshire, stands, surrounded by beech-clad hills, on the Wye, a small feeder of the Thames, 25 miles ESE. of Oxford and 31 (by rail 26½) WNW. of London. It has a fine cruciform parish church (1273–1522; restored 1873–75) with a tower 96 feet high, a guildhall (1757–1859), a town-hall (1904), a literary institute (1854), a free library, a War Memorial hospital (1923), a grammar-school (1555; new buildings, 1883; 1915), and an auction-mart (1887). The staple manufacture is that of beech-wood and other chairs, also whole furniture suites in walnut, mahogany, and other woods. Reproduction of antiques is a feature. There are also some large paper-mills in the town and district. Hughenden and Chalfont, both noticed separately, are near. Some Roman remains have been found. High Wycombe, which returned two members till 1867, and then one till 1885, was governed by a mayor in Henry III.'s time, but did not receive its charter of incorporation till 1558. Pop. (1881) 10,618; (1921) 21,937.

Wye, a river of Wales and England, of great picturesque beauty, an affluent of the Severn, has its origin in two copious springs which issue from the south-east side of Plinlimmon, not 2 miles from the head-water of the Severn (q.v.). It thence flows 150 miles in a general south-east direction through or along the borders of the counties of Montgomery, Radnor, Brecknock, Hereford, Monmouth, and Gloucester, till it enters the Severn's estuary below Chepstow. At Chepstow the tide has been known to rise 47 feet above low-water mark. The chief affluents are the Lug and Ithon on the left, and the Monnow, the Caerwen, and Irfron on the right. Fly-fishing for salmon has suffered much from netting at the mouth. The Wye is not much of a boating river. The part separating Monmouth from Gloucester is that chiefly visited for its singular beauty. See CHEPSTOW, TINTERN, ROSS, &c.

Wykeham, WILLIAM DE, was one of those ecclesiastics who from small beginnings rose to almost princely power. Froissart says that in his day 'everything was done by him and nothing without him.' So obscure was his origin that there has been a controversy as to what was his surname. His mother, Sibilla, was the granddaughter of the 'Lord of Stratton,' but his father was a yeoman called John Longe, perhaps on account of his stature. He was born in 1324 at Wickham—a small Hampshire village, 3 miles from Fareham. The place was sometimes called Wickham-Scures from the family to whom it belonged; and some benefactor, possibly Sir John Scures, who was almost the viceroy of the southern counties, sent him to school at Winchester. There he learned French, some Latin, arithmetic, and geometry. The constable of Winchester Castle appointed him his secretary, and some time later he was transferred to the service of Edward III. In 1351 Sir J. de Brocas was in a commission for repairing Windsor Castle, and Wykeham has been thought, apparently in error, to have had a hand in the construction of the Round Tower. He was surveyor of Windsor and other royal castles in 1356–59, was Keeper of the Privy-seal and secretary to the king in 1364, and in 1367 was consecrated Bishop of Winchester and Chancellor of England. Towards the end of Edward III.'s reign he, and many others, had some differences with the Duke of Lancaster and Alice Perrers, but he found means to conciliate her and proceed with the founding of his colleges. In 1380 New College, Oxford, was commenced, and in 1388 Winchester School was begun, which was finished in 1394. That year, when seventy years of age, he undertook the transformation of the nave of Winchester Cathedral, personally supervised the work until the last two years of his life, and possibly drew his own plans. In 1404 he finished his magnificent chantry at Winchester, and, dying in that year, was buried in it, on the spot where as a boy he used to kneel before the figure of the Virgin. He regarded Mary as his especial patroness, and dedicated both his colleges to her. Wykeham held large church preferment, but had he lived later would probably have been merely a great official. He was not an ardent theologian, and it is doubtful if he was an architect. But he was generous and religious—he founded his colleges 'first for the glory of God and the promotion of divine service, and secondarily for scholarship.' His famous motto was 'Manners'—i.e. morals—'maketh man,' and he carried out useful reforms at St Cross and in St Swithun's. In politics he may have been opposed to the papal court. At the close of his life he was present in the parliament when Richard II. was deposed, and in the first one held by Henry IV. He has been called the 'father of the public-school system'; and although he did not invent Perpendicular architecture, he established it, and saved Gothic in England from the degeneracy it underwent abroad. His style of building can best be studied at Winchester. These relics of Wykeham remain at New College: an autograph letter, part of his mitre, his silver Pastoral Staff (q.v.), silk gloves, and jewelled morse. In the British Museum are some charters in his handwriting.

See WINCHESTER and works there cited; and Lives by Lowth (1759; new ed. 1777), Chandler (1842), Moberly (1893); Collins, *Typical English Churchmen* (1909).

Wynaad, or WAINÁD (better Vayanád), a highland district, mainly a tableland, in the Western Ghâts, about 3000 feet above sea-level, and belonging partly to the Nilgiri district, partly to Malabar. The name is well known in England through the auriferous quartz almost universally distributed throughout the region, which began to be worked as a gold-field about 1865, and, after absorbing in 1876–86 millions of British capital, failed to fulfil the extravagant expectations formed.

Wynberg, a town on the SE. slopes of Table Mountain, 8 miles SE. of Cape Town by rail, the centre of a rich wine-growing country; pop. 16,000.

Wyndham, SIR CHARLES (1841–1919), born at Liverpool, took up medicine, but in 1864 definitely abandoned it for the stage, and achieved a great reputation as a finished and polished actor of comedies. He built and opened Wyndham's Theatre in London in 1899, and was knighted in 1902.

Wyndham, GEORGE (1863–1913), born in London, entered the army from Sandhurst, but soon took up politics, becoming private secretary to A. J. (Lord) Balfour, 1887–1892, and Conservative M.P. from 1889 till his death. When Chief Secretary for Ireland, 1900–5, he carried an important Land Purchase Act. He published an edition of Shakespeare's poems, and wrote on Plutarch and Ronsard. See *Life and Letters*, ed. Mackail and Wyndham (1925).

Wynkyn de Worde. See WORDE.

Wyntoun, ANDREW OF, an old rhyming chronicler, about whom we know only that he was a canon regular of St Andrews, who about 1395 became prior of the monastery of St Serf on Loch-

leven, and that he wrote *The Orygynale Cronykil of Scotland*, a work of considerable historical importance. Philologically it has very distinct value as a specimen of old Scots, which was not appreciably different from contemporary northern Middle English. The *Cronykil* is brought down to 1406, and consists of nine books, of which only the last four are devoted to Scottish history; the first five giving a fragmentary outline of the history and geography of the ancient world. From his quotations Wyntoun seems to have been a well-read scholar for his time. He incorporates long passages from Barbour and an unnamed writer. His verse, like Barbour's, is octosyllabic.

David Macpherson edited the Scottish portion (2 vols. 1795); a complete edition was published by David Laing ('Historians of Scotland'; 3 vols. 1872–79); and a more elaborate one, with double text and variants, by Amours (Scottish Text Society, 6 vols. 1903 *et seq.*).

Wyo'ming, a north-western state of the American Union, ranking eighth in area but second lowest in population of all the states and territories, lies mainly on the eastern slope of the Rocky Mountains. It is bounded on the N. by Montana, E. by South Dakota and Nebraska, S. by Colorado and Utah, and W. by Utah, Idaho, and Montana. From east to west the length is 365 miles, and the width from north to south is 274 miles. Area, 97,914 sq. m. The state is traversed by the main axis of the Rocky Mountains, which constitutes the continental divide, and the greater part of it is a mountainous region. The northern group of the Rocky Mountain system finds here its greatest development, and is noted for its wild and rugged character and for its picturesque scenery. In the west central part are the Wind River Mountains (see UNITED STATES), in the north central part the Big Horn Mountains, in the extreme north-east the Black Hills extending into South Dakota, in the south-east the Laramie Range, in the south the Medicine Bow Mountains, north of which are the Sweetwater and Rattlesnake ranges, and in the west the Teton, Shoshone, and Gros Ventre ranges. Among the principal peaks are Frémont's Peak (13,790 feet), Mount Hayden (13,691 feet), Snow's Peak (13,570 feet), Wind River Peak (13,499 feet), Mount Chauvenet (13,000 feet), Mount Hooker (12,900 feet), Mount Moran (12,800 feet), and Washakie Needle (12,253 feet). The Yellowstone (q.v.) National Park, 3300 sq. m. in area, occupies the north-western corner, and is mainly within the limits of this state. The mountains are covered with forests of considerable extent, occupying one-eighth of the total area. Interspersed between the ranges are broad plateaus with arable soils, which with proper irrigation yield prolific crops of cereals, vegetables, and fruits, while dry farming is also carried on. About half the state is suitable for excellent grazing; and the raising of cattle and sheep is very important. The mean elevation of the plateau regions is from 7000 to 8000 feet. Yellowstone Lake has an altitude of 7778, Lewis Lake 7750, and Shoshone Lake 7670 feet above the level of the sea. The south-western portion of the state slopes towards the Pacific Ocean and forms a part of the Green River valley. The eastern part of the state is drained by tributaries of the Missouri, the western by the Snake or Shoshone River, which ultimately joins the Columbia, and in the south-west is the Green River, which eventually discharges its waters into the Colorado. In the mountain regions are deposits of gold and silver and copper ore, while there are vast beds of iron ore. Near Evanston, Carbon, and Rock Springs, and in some other localities, there is found a superior quality of soft coal in great abundance. These deposits are extensively worked, and furnish fuel for nearly all the railroads and for the towns and settlements of the state. The state also possesses deposits of soda, some tin, abundance of limestone, and valuable petroleum oil-fields in the centre and north. There are a few local manufactures. The climate is dry, although the country is well watered by streams. The summers are mild and delightful. In exposed regions the winters are severe, but in general the climate is conducive to health and comfort. The state is divided into twenty-three counties, and has one representative in congress. The chief towns are Cheyenne (the capital, 13,200), Casper (23,300), and Laramie (9,600) the seat of Wyoming University and Agricultural College. Wyoming comprises portions of the territory acquired by the Louisiana Purchase of 1803, and of that obtained by the treaty with Mexico in 1848. A territory from 1868, it was admitted as a state in 1890. Pop. (1870) 9118; (1880) 20,789; (1900) 92,531; (1920) 194,402.

Wyoming Valley, a beautiful, fertile valley on the Susquehanna River, in north-eastern Pennsylvania, about 30 miles long by 5 wide, its name supposed to be a corruption of the Indian *Maughwauwama*—'large plains.' It was purchased (1754) by a Connecticut company from the Six Nations, but the settlers were soon dispersed by hostile savages. In 1769 forty pioneers came from Connecticut, but found a party of Pennsylvanians in possession, and for several years there were continual contests between the rival settlers, the Connecticut colony finally proving successful, and their town of Westmoreland growing to 2000 inhabitants. On 30th June 1778, when most of their men were serving or had fallen under Washington, a force of 400 British provincials, or 'Tories,' and 700 Seneca Indians, led by Colonel John Butler, entered the valley, and were opposed by 300 men, under Colonel Zebulon Butler. On July 3 the settlers were driven to the shelter of Fort Forty (named after the pioneers), with the loss of two-thirds of their number, many soldiers and inhabitants being murdered; a half-breed Indian woman, called Queen Esther, having, in revenge for her son's death, tomahawked fourteen prisoners with her own hand. On the 5th the remnant of the troops surrendered, and they and the inhabitants were either massacred or driven from the valley, which was left a smoking solitude. Campbell's *Gertrude of Wyoming*, founded upon this disaster, contains exaggerations and misstatements, notably that of attributing the leadership to Brant (q.v.), who was not in the expedition. The disputes between the Connecticut and Pennsylvanian settlers were not finally settled for several years after. The valley is now one of the most flourishing districts in the state, and very rich in anthracite coal.

Wyon, the name of a family descended from George Wyon (died 1796), designer and modeller to a plate company in Birmingham; of which no less than seven members were chief engravers of seals to the government or chief engravers to the London Mint. Perhaps the most eminent were Thomas Wyon the Elder (1767–1830), his son Thomas the Younger (1792–1817), and his nephew William (signing with the initials W. W.; 1795–1851).

Wyre Forest, in the north-west of Worcestershire, near Bewdley, forms the southern part of the Severn coalfield.

Wyspiański, STANISŁAW (1869–1907), Polish dramatist, strongly influenced by the principles of Greek tragedy, strove to unite in the theatre all the arts. His most powerful works, on Polish subjects, comprise the trilogy based on the rebellion of 1831 (*The Song of Warsaw, Lelewel, The November Night*), and the trilogy based on problems of modern national existence (*The Wed-*

ding, *The Deliverance*, *Akropolis*). He was also a painter of merit. See THEATRE.

Wyss, HANS GEORG VON (1816–93), was professor of Swiss History at Zürich and wrote a series of works on the history of Zürich and adjoining cantons. See Life by Meyer von Kronau (1896).

Wyss, JOHANN RUDOLF, author of *The Swiss Family Robinson*, was born at Bern, 13th March 1781, became professor of Philosophy there in 1806, later chief-librarian also, and died 31st March 1830. His books on the supreme good (2 vols. 1811), his collections of Swiss tales and folklore (3 vols. 1815–1822), and other Swiss publications (15 vols.) were less popular than his *Swiss Family Robinson* (1812; trans. 1820-49)—one of the best known of the vast library of *Robinsonaden* or German imitations of *Robinson Crusoe*, of which before 1850 some fifty or more had appeared. See Haken, *Bibliothek der Robinsone* (1805–8); Kippenberg, *Robinson in Deutschland* (1892).

Wyttenbach, DANIEL (1746–1820), born at Bern, studied in Germany and Holland, became professor of Greek at Amsterdam in 1771, and in 1779 succeeded Ruhnken at Leyden. He edited Plutarch's *Moralia*, Plato's *Phædo*, and some other Greek texts, wrote the life of Ruhnken, and contributed largely to the great *Bibliotheca Critica* (1777–1808), of which he was the chief editor. His wife wrote also on classical subjects and was Ph.D. of Marburg.

Wyvern (from Lat. *vipera*), a fictitious monster allied to dragon and griffin, and frequent in heraldry. It resembles a dragon, but has only two legs and feet, which are like those of the eagle.

X

the twenty-fourth letter of the English and the twenty-first of the Latin alphabet, descends from the fifteenth letter of the ancient Semitic alphabet. Its Semitic name, in Hebrew *sâmekh*, in Syriac *semkath*, probably meant a prop or support, from the root *s-m-k*, meaning to hold up, support. On the Moabite Stone (9th century B.C.) it appears as ; the form in later inscriptions may possibly be more original, and have been intended to represent the object denoted by the name. Through a series of gradual modifications the form became the of the square Hebrew alphabet. The sound of the letter in Hebrew and Aramaic is *s*; but in the Semitic dialect of the people from whom the Greeks learned the alphabet it was probably *sh* (see the article on S). This sound did not exist in Greek, and the Greeks used the letter to denote the combination *ks*. In early Greek inscriptions its chief forms are (whence the modern Ξ ξ); a local variety was , afterwards modified into X, the form adopted by the Romans. The Greek name of the letter was *xī*, possibly suggested by the name of the neighbouring letter *pī*.

As the letter expresses a combination of two sounds both provided for in the alphabet, it was not strictly needed either in Greek or Latin. The Romans evidently discarded it for a time, and afterwards restored it, placing it at the end of the alphabet (Y and Z being later additions). The letter had in Latin always the power of *ks*, and was originally used with the same value in the languages that inherited or adopted the Latin alphabet; but owing to sound-change and sound-substitution it has now various pronunciations. In French and English it is normally *ks*, but in the middle of a word before a stressed vowel it is usually *gz*. The initial combination *ks* is foreign to Latin and to all the modern languages; in French an initial x in learned words from Greek is pronounced as *ks*, but in English as *z*. The letter in French has occasionally the sounds of *s* and *z*. In Spanish x was formerly, and in Portuguese is still, pronounced *sh*; in later Spanish this sound changed into the sound of *ch* in *loch*; in modern spelling j is substituted for x, as in *Don Quijote*.

The Latin name of X was *ix* (perhaps influenced by the Greek name *xī*), which is retained in French and German. The English alteration to *ex* is due to the analogy of the name of S. In Spanish the letter is called *équis* (pronounced *ékis*).

Xanthe (Turk. *Eskiche*), a town of Greece on the river Mesta, 200 miles W. of Constantinople, with an important trade in tobacco; pop. 25,000.

Xanthin (Gr. *xanthos*, 'yellow'), a name given to the yellow colouring matter of various flowers, to a principle in madder, and to a deposit of urine.

Xanthippe. See SOCRATES.

Xanthoxylum, a rectified spelling of Zanthoxylum (q.v.).

Xanthus, the capital of ancient Lycia (q.v.), on the river Xanthus, 8 miles from its mouth. It offered a desperate but vain resistance to Cyrus's army under Harpagus, in 546 B.C., and again in 42 B.C. to Brutus. In ancient times it was rich in temples and sepulchral monuments, and extensive remains were discovered by Sir C. Fellows (q.v.).

Xavier, FRANCISCO, the 'Apostle of the Indies,' was born of a noble family at his mother's castle of Xavero or Xavier, near Sanguesa, in the Basque country, April 7, 1506, youngest son of Juan de Jasso, privy-councillor to Jean d'Albret, king of Navarre, and his wife Maria Azpilcueta Xavier. He was sent in his eighteenth year to the college of St Barbara at Paris, and was already a lecturer on the Aristotelian philosophy when he made the acquaintance of Ignatius Loyola (q.v.), with whom ere long he became associated in the foundation of the Jesuit Society (1534). Ordained priest at Venice in 1537, he lived some years at Rome in the service of the society. John III. of Portugal having resolved to send out members of the new order as missionaries to the Portuguese colonies in the east, Xavier was chosen in the place of Bobadilla, who was prevented from going by sickness. He sailed from Lisbon, April 7, 1541, wintered at Mozambique, and arrived at Goa, May 6, 1542. His first task was to rouse a spirit of penitence and religious fervour among the corrupt Europeans, and thus remove the great obstacle to the conversion of the native population. His efforts were eminently successful, and he was equally blessed in his labours among the pearl-fishing population of the coast. After a stay of more than a year in this region he returned to Goa, and with fresh assistants visited the kingdom of Travancore, where in a single month he baptised 10,000 natives. Passing thence to Malacca, he next proceeded in 1546 to the Banda Islands, to Amboyna, and the Moluccas, and then retraced his steps by Malacca (1547) and Manassar to the island of Ceylon, where he converted the king of Kandy with many of his people. His next ambition was the conversion of the Japanese empire, which had been suggested to him at Malacca by Han Siro, a Japanese exile. His preaching at Miako and Fucheo was attended with extraordinary fruits, and the splendour he had put on here from motives of policy so much impressed the Japanese that the mission he founded was allowed to flourish for above a hundred years. Xavier's mission to Japan occupied about two and a half years; he returned to Goa in 1552 to organise a mission to China. But the intrigues of the Portuguese merchants and the envious hatred of the governor of Malacca to Pereira, the envoy to China he had chosen, raised so many difficulties that his spirit gave way, and he sank under the combined weight of mental depression and physical sickness, on the very threshold of what he had looked to as the great enterprise of his life, in the island of Sancian, December 22, 1552. His body was conveyed to

Malacca, and thence with great solemnity to Goa, March 15, 1554. Many miracles, attested by numerous witnesses, were reported of Xavier in almost all the stages of his career. Among these is reckoned the miraculous gift of tongues, and this was fortunate, for it appears that by nature he had no gift for languages. The evidence of these miracles was submitted to the usual process of inquiry at Rome, and, many miracles having been established, Xavier was beatified by Paul V. in 1619, and canonised by Gregory XV. in 1622, his festival being fixed upon 3d December.

His only literary remains are a collection of Letters, in 5 books (Paris, 1631), and a Catechism, with some short ascetic treatises. His Life, by Père Bouhours (1684), was translated by James Dryden, brother of the poet. There are also Lives in Latin by Torsellino (1596), in Italian, by Bartoli and Maffei (1653), in German, by De Vos (1877), and in English, by Venn (1862), H. J. Coleridge (1873), Mary H. McClean (1896), and Edith Stewart, with translations from the Letters by D. Macdonald (1917). See also the scholarly life in French by J. M. Gros, S.J. (1900).

Xebec. See SAIL.

Xenia, capital of Greene county, Ohio, on the Little Miami River, 65 miles by rail NNE. of Cincinatti, the centre of a rich agricultural district, and an active manufacturing town; pop. 9000.

Xenocrates, an ancient philosopher, was born at Chalcedon 396 B.C., and governed the Academy as successor to Speusippus, himself the successor of Plato, from 339 till his death in 314. He wrote upon dialectics, physics, and ethics, and introduced into the Academy the mystic Pythagorean doctrine of numbers in connection with the *ideas* of Plato.

Xenon (Xe; atom. number, 54; atom. wt. 130·2), a gaseous element existing in very minute proportions in the Atmosphere (q.v.), discovered by Sir W. Ramsay in 1898 as a residuum in the distillation of liquid Argon (q.v.).

Xenophanes (fl. 540–500 B.C.), founder of the Eleatic School (q.v.), was born at Colophon in Asia Minor, but lived mostly at Elea in southern Italy. He attacked anthropomorphism and polytheism, and maintained the unity of the Supreme Being. There are Studies in German by Kern (1874) and Mavrokordatos (1910), in French by Thill (1888), and in Italian by Orvieto (1899).

Xenophon, Greek historian, miscellaneous essayist, and military commander (*c.* 435–354 B.C.), was son of Gryllus, an Athenian knight. The biography by Diogenes Laertius, and the scattered notices of him found in other ancient writings, together with the data supplied by his own *Anabasis*, are the only materials for his life. Little or nothing is known of the first thirty-five years which he spent at Athens, except that he came under the influence of Socrates from an early period. The tradition of his having been rescued by that philosopher at the battle of Delium, 424 B.C., which would carry back the date of his birth to 444–443, is probably apocryphal; at any rate it is inconsistent with his own statement about himself in the *Anabasis* (III. i. 25). In 401, the political situation of Athens offering no scope for his activity, he accepted the invitation of Proxenus of Bœotia—an old guest-friend and adventurer in command of a regiment of Hellenic mercenaries under Cyrus—to join him at Sardis and take service under the Persian prince in his military enterprise, directed ostensibly against the Pisidians, a refractory vassal tribe, but really against his own brother, King Artaxerxes Mnemon; but he went in a civil rather than a military capacity. It was only after the failure of this bold scheme of usurpation, and the death of the rebel prince in the affray between the two brothers in the plain of Cunaxa (Babylon), September 3, 401, that Xenophon became one of the regular officers, and finally the successor of Proxenus in the supreme command of the Ten Thousand Greeks left alone in the centre of the Persian empire, when five of their generals and twenty subordinate officers had been treacherously massacred in the enemy's camp, and there was a general break-up of the Cyreian Asiatic insurgents. Xenophon thereupon became the life and soul of the army in its march of 1500 miles, as they fought their way against the ferocious mountain tribes through the rugged highlands of Armenia and the ice and snow of an inclement winter, and conducted them with such skill, foresight, and prowess that in five months they were able to reach Trapezus (*Trebizond*), a Greek colony on the Black Sea, and ultimately Chrysopolis (*Scutari*), opposite Byzantium, on the Bosporus, in October 399. After further adventures and difficulties, they accepted service for a short time under Seuthes, a Thracian chief, who wanted their aid in recovering the kingly power, and finally recrossed to Pergamus, where Xenophon provided them with permanent service in the Lacedæmonian army under Thibron, who had been engaged to continue the war against the satraps Pharnabazus and Tissaphernes, for the deliverance of the Æolian Greeks from the Persian yoke. It is not certain what became of Xenophon after Thibron's recall—whether he went back to Athens, as it appears from vii. 7, 57, he intended; but the evidence seems to show that he continued with his successor Dercyllidas, and that the sentence of banishment for 'laconism'—in other words, attachment to the cause of a traitor in alliance with Sparta—was passed against him in 399, the year of the execution of his old friend and master, Socrates. If he did go back to Athens, he must have returned to Asia in 396, when a new epoch in his life began with the arrival of Agesilaus in command of a new Spartan army. With this great king Xenophon, who saw in him the ideal of a Greek hero, formed the closest friendship. He accompanied him in his eastern campaign, and was in his suite when he returned to Greece to conduct the war against the newly-formed anti-Spartan league of Athens, Corinth, and Thebes (394), and witnessed the battle of Coronea, of which he gives a graphic description (*Hell.* IV. iii. 16 ff.). Such disloyal and unpatriotic conduct may be explained, if not excused, by his political sentiments. Xenophon saw no hope for Athens, except in league with Sparta. If Athens and Sparta combined, then might Greece be mistress of the world. Hence his aversion for the democratic party at Athens, which was the chief hindrance to such a union. Xenophon accompanied the king to Sparta, where he resided on and off, until, in compensation for the loss of his country and in recognition of his services, the Spartans presented him with an estate at Scillus, one of the Triphylian towns taken from Elis (400), lying on the road from Lacedæmon to Olympia. Here in 387 he went with his wife Philesia and his two sons, Gryllus and Diodorus; here he spent some twenty years of his life, careless of war and politics, indulging his taste for literary work and the pursuits of a country gentleman. Here, too, were penned most of his important books. But the break-up of Spartan ascendency after the battle of Leuctra (371) drove him from his tranquil retreat to seek a home elsewhere. The Athenians, who had now joined the Spartans against Thebes, repealed the sentence of banishment against him, but he did not avail himself of this act of grace to return to his native place; he travelled towards it, but no farther than Corinth, where he took up his abode and lived to *c.* 355.

The writings which Xenophon has left behind

him are not a bad index of his character; they give us the idea of having been written with great singleness of purpose, modesty, and love of truth. The leading feature of his character seems to have been an active susceptibility and admiration for all that is noble and beautiful. This trait will account for his faithful attachment to great personalities like Socrates, Agesilaus, and the younger Cyrus, and explain why in his narrative of particular actions or description of individuals he makes a point of presenting the bright side of things and concealing the dark, while in his philosophical works he brings on the scene almost exclusively noble and pleasant portraits. With this lovable trait he unites on the one hand a natural kindness and mildness of disposition, and on the other good sense, firmness, and courage. While his intercourse with Socrates and his studious habits stimulated and elevated his higher nature, his lower nature was invigorated by gymnastic and warlike exercises, so that he realised in a high degree the Greek ideal of perfect manhood in the symmetrical development of his bodily and mental powers. Nor did age obliterate his youthful impressions. He retained the strong religious sentiments and profound conviction of a divine mediation in the government of the world throughout life, and turned to account in his own practical way the splendid teaching of Socrates, although he had no capacity for pure philosophical speculations. They have a direct or indirect relation to some particular period of his life, in their outward circumstances, their political and civil bearings, and their spiritual tendency. They may be conveniently distributed into four groups: (1) Historical—the *Hellenics*, *Anabasis*, and *Encomium of Agesilaus*. (2) Technical and didactic—on *Horsemanship*, the *Hipparchicus* or 'Guide for a cavalry commander,' and the *Cynegeticus* or 'Guide to Hunting.' (3) Politico-philosophical—*The Lacedaemonian Polity*, *The Cyropaedeia*, *Athenian Finance*. (4) Ethico-philosophical—*Memorials of Socrates*, *Symposion*, *Oeconomicus*, *Hieron*, *Apology of Socrates*. The *Polity of Athens* is now commonly regarded as an anonymous work written about 415 B.C., which was incorporated in the collection of Xenophon's works only because of its analogy to the *Polity of Lacedaemon*. The style and language of Xenophon is unaffected, simple, and clear, without any attempt at ornamentation; it is well described by Dionysius, the greatest of ancient Greek critics, in his *Letter to Pompeius*, as 'sufficiently pure and clear; in the choice of expressions he prefers those which were ordinary and suitable to the actions, and he arranges them in a pleasant and agreeable manner' —and this judgment is confirmed by Quintilian, the greatest of Latin critics. The dialect he uses is the Attic, but not the purest; his long absence from Athens and intercourse with Ionians and Lacedæmonians familiarised him with many foreign words which he does not hesitate to employ if they serve his purpose.

The earliest printed edition of any of Xenophon's works is the Latin version of the *Cyropaedeia* by F. Philelfus (Rome, 1473). The *editio princeps* of the Greek text was that of Boninus, printed by P. Giunta (Florence, 1516, reprinted in 1527), followed by the Aldine in 1525. In the long list of subsequent editions of the whole or part of his works the most important names are those of Zeune, T. Hutchinson, Weiske, J. F. Fischer, J. G. Schneider, F. A. Bornemann, L. Breitenbach, K. W. Krüger, R. Kühner, G. A. Sauppe, L. Dindorf, K. Schenkl, F. K. Hertlein, Cobet, O. Keller (*Hellenica*), Zurborg, Arnold Hug (*Anabasis* and *Cyropaedeia*). There are editions with notes in English of the *Cyropaedeia*, *Hieron*, and *Oeconomicus* by H. A. Holden, the writer of the above article, of the *Anabasis* by A. Pretor, and of the *Memorabilia* by J. Marshall. There are several lexicons, to the whole works by F. G. Sturz, to portions by G. A. Koch, K. W. Krüger, H. L. Strack, C. Thiemann, and F. Volbrecht. See Roquette's *De Xenophontis vita* (1884), Croiset's *Xénophon* (1873), the German life by Lange (1900), and J. B. Bury's *Ancient Greek Historians* (1909). There are translations by H. G. Dakyns (4 vols. 1890–99), and J. S. Watson; also of the *Cyropaedeia* by Miller, and of the *Hellenica* by Brownson, in the Loeb series.

Xeres, or (1) JEREZ DE LA FRONTERA, an important town of Spain, 14 (by rail 30) miles NE. of Cádiz, with a Moorish castle (*Alcázar*), a collegiate church, a handsome municipal building, and many large *bodegas* or wine-stores. It is the centre of the trade in Sherry (q.v.). The *Asta Regia* of the Romans, it owes its modern name to the Moors, who near by fought a seven days' battle and defeated Roderic, the last of the Goths, in 711. Pop. (1920) 64,861.—(2) XEREZ DE LOS CABALLEROS, 40 miles S. of Badajoz, is a picturesque old town, once a seat of the Templars (hence the name); parts of the castle remain, and much of the old Moorish wall. Pop. (1920) 14,991.

Xerophytes. See ECOLOGY, SUCCULENT PLANTS.

Xerxes I., king of Persia in 485–465 B.C., was the son of Darius and Atossa, and succeeded when Darius died in the midst of his preparations for a third expedition against Greece. He first subdued the rebellious Egyptians, then started with an army consisting of immense hordes of men from all parts of the vast Persian empire, and an enormous fleet furnished by the Phœnicians. He crossed the Hellespont by a bridge of boats, an English mile in length, and when the bridge was destroyed by a storm is said to have ordered 300 lashes to be given to the rebellious sea. Another bridge, consisting of a double line of boats, was built, and a canal cut through Mount Athos. The preparations were completed in 481 B.C., and in the autumn of that year Xerxes arrived at Sardis, where he wintered. Next year the vast assemblage began to march towards the Hellespont; it took, says Herodotus, seven days and nights to pass the bridge. After crossing the Hellespont the march was continued along the Thracian coast towards the plain of Doriscus on the Hebrus, where the army was numbered. Herodotus puts the whole number of fighting-men at 2,641,610; the ships of war at 1207, besides 3000 smaller vessels. This immense force moved on without resistance till it reached Thermopylæ (q.v.), where it was brought to a stand by Leonidas and his 300 Spartans. After these were all slain Xerxes marched onwards through Phocis and Bœotia, and on arriving at Athens in the summer of 480, three months after crossing the Hellespont, he found it deserted, and destroyed alike temples and houses. Meantime the two fleets had sailed round from Eubœa in the narrow strait between Salamis and the Attic coast, where took place the famous naval battle of Salamis (q.v.). Xerxes witnessed the fight from a lofty throne which he had erected. Confounded at the result of all his mighty preparations, he fled with all haste towards the Hellespont. Mardonius was left with 300,000 men to carry on operations in Greece, and his hopes of conquest died with him on the fatal field of Platæa (479 B.C.). Xerxes was murdered by Artabanus in 465, and was succeeded by his son Artaxerxes.

Xesibeland, between Griqualand East and Pondoland, was annexed to Cape Colony in 1886.

Xime'nes de Cisneros, FRANCISCO (in modern Spanish spelling *Jiménez*), cardinal-statesman, was born of an ancient but impoverished family at Torrelaguna, in Castile, in 1436. He was educated at Alcalá de Henares, Salamanca, and finally Rome, where he obtained from the

pope a provisional or prospective nomination to the archpriestship of Uzeda in Toledo. The archbishop refused to admit him, and flung him into prison, where he lay for six years. On his release he was named Vicar-general of Cardinal Mendoza at Siguenza; but he suddenly threw up this preferment and the most brilliant worldly prospects to enter the Franciscan monastery of San Juan de los Reyes at Toledo (1482). His reputation for piety and learning led Queen Isabella to choose him for her confessor in 1492, and three years later to name him Archbishop of Toledo—a dignity which he refused to accept until he received an express command from the pope. Compelled to yield, he continued as archbishop the life of mortification and austerity of the monk, applying to purposes of religion and charity the whole of the princely revenues of his see; and even when admonished by the pope to maintain the dignity of his position, he hid the hair shirt of the ascetic under the gorgeous robe. As confessor and confidential adviser of the queen, Ximenes during the lifetime of Isabella was the guiding spirit of Spanish affairs; and on her death in 1504 he held the balance between the parties of Ferdinand and Philip of Burgundy, husband of Joanna, the heiress to the crown. On the death of Philip in 1506 Ximenes was appointed regent in consequence of the insanity of Joanna and the absence of Ferdinand, and he conducted the affairs of the kingdom through a critical time with consummate skill. In 1507 he was created cardinal, and next year he organised at his own expense, and himself accompanied as commander, the celebrated expedition for the conquest of Oran and extirpation of piracy, consisting of 10,000 foot and 4000 horse. Ferdinand died in January 1516, and on his deathbed named Ximenes regent of Spain till the arrival of his grandson Charles; and although the grandees had organised an opposition as well to himself as to the royal authority, the aged cardinal quickly overawed them into submission, and with the same vigour quelled the incipient revolt of Navarre. In September 1517 Charles at length landed on the soil of Spain, and Ximenes at once set out to meet him, but was seized with a mortal illness on the way, and died at Roa, November 8, 1517, probably before receiving the cold letter of Charles, which was equivalent to dismissal.

As a statesman and administrator Cardinal Ximenes showed inflexible determination and courage, but it is scarcely doubtful that his measures did a fatal injury to Spain, by building up to an excessive height the power of the crown, and by mercilessly crushing the conquered Moors. He was fanatical in his hatred of heresy, and as Grand-inquisitor is supposed to have caused the death of as many as 2500 persons. The social and political revolution he effected in breaking down the feudal power of the nobles has often been compared with the analogous change wrought in France by Richelieu. His munificence as a patron of religion, of letters, and of art has been the theme of praise in every history of his time. He founded and endowed the university of Alcalá de Henares, and published the famous Complutensian Polyglot—a magnificent undertaking, on which he expended half a million ducats (see POLYGLOT). His expenditure on churches, hospitals, schools, and benevolence was correspondingly munificent.

The chief authority for his Life is the work by Alvaro Gomez de Castro, *De rebus gestis Francisci Ximenii* (1659). Other Lives are by Hefele (2d ed. 1851; trans. 1860) and Huidobro (Santander, 1901), Lyall (1917).

X-Rays. See RÖNTGEN.

Xylem. See WOOD.

Xylography. See WOOD-ENGRAVING.

Xyloidine, an explosive like gun-cotton, prepared by the action of strong nitric acid on starch or woody fibre.

Xylol, any of the metameric dimethyl benzenes. See AROMATIC SERIES.

Xylonite, a kind of Celluloid (q.v.).

Xylophaga. See BORERS.

Xylophone, a musical instrument consisting of 18 to 36 wooden (occasionally bronze) bars of different lengths, tuned to the chromatic scale, and loosely fixed on a wooden frame covered with strips of felt. The bars are struck with wooden hammers, and the tone quality is hard and brittle, but not very penetrating. Primitive xylophones are found among the Tatars, while similar instruments are the gambang of Java and the marimba, widely spread through West and Central Africa.

X Y Z Correspondence, in U.S. history, is the name given to the despatches of the three commissioners to France, Marshall, Pinckney, and Gerry, containing the insulting demands made by Talleyrand and the other Directors as the price of respect and courtesy to the American republic. In the otherwise complete copies published by congress President Adams substituted X, Y, and Z for the names of Talleyrand's emissaries.

Y

the twenty-fifth letter of our alphabet, was added to the Roman alphabet at a late period. The Greek Υ (now printed υ, *v*), which in an earlier form had been adopted into the Latin alphabet as V, with the sound of *u* (see the article U), had in late Greek come to be sounded like the French *u* or the German *ü*. This sound was foreign to Latin, so that when Greek proper names of words adopted from Greek had to be written in Roman characters it had no appropriate symbol. The Greek letter in its contemporary form was therefore adopted for this purpose. In late Greek, and consequently in late Latin, the letter came to be pronounced like I; and as in late Latin the words of Greek origin containing it were numerous, it was in the Middle Ages regarded, throughout Latin Europe, as an optional substitute for I, especially in positions where the minuscule *i* (a short downstroke without any dot) was liable to be mistaken for one of the compound strokes of *m*, *n*, or *u*.

When, at the beginning of the 7th century, the Latin alphabet was applied to the writing of Old English, the letter was used with its Greek value, to express the high-front-sound vowel (*ü*). As a minuscule, it had various forms; in late Old English it usually resembled the modern printed y, and was often written with a dot over it (ẏ), which continued to be used, both in England and on the continent, down to the 14th century. The capital letter appears on coins in the form Y; but in a series of Northumbrian coins of about A.D. 800, the moneyer Cynwulf uses Ψ for the second letter of his name. This is probably not to be regarded as a variety of the Roman letter, but as an independent symbol, formed by inserting an I within a V; a very suitable notation, as the sound *ü* combines the position of the lips for *u* with the position of the tongue for *i*. (A similar device, in principle, had been used in the native Runic alphabet.)

In the French spelling used for English from the latter part of the 12th century, the latter had its general European function as an optional substitute for I. It was also used by some scribes instead of the native ȝ (see the article G) to express the consonantised *i*-sound (or the voiced front spirant consonant) heard in the modern *yes*, *young*. This use gradually became more common, so that the early printers found themselves able to dispense with the ȝ altogether. In middle English MSS. the letter þ (=th) was often written exactly like *y*. In small words like *the*, *this*, *that*, the use of *y* for *th* remained common, even in printed books, down to the middle of the 17th century; the form 'ye' for *the* occurs in letters written as late as the 19th century.

In modern English the letter, when used as a consonant, has always the same sound (*yes*, *young*). As a vowel-symbol, it is phonetically equivalent to I in all its diverse values, except that it never stands for the sound heard in *machine*. In words of Greek derivation (e.g. *chyme*, *rhythm*, *oxygen*), it represents the Greek *u*; such spellings as *sylvan*, *style*, for the etymologically correct *silvan*, *stile*, reflect erroneous forms once current in printed Latin. Except in classical derivatives, the use of the letter in modern English orthography is somewhat capricious. In general, *y* has superseded *i* or *ie* at the end of a word, but not in other positions (compare *sky*, *skies*; *try*, *tried*; *carry*, *carried*, *carrier*), except when *i* follows, as in *trying*, *carrying*, *lobbyist*. The final combinations *ay*, *ey*, *oy*, *uy*, remain unchanged before suffixes, except in *laid*, *paid*, *said*. The dislike felt for words of only two letters accounts for the use of *ie* instead of *y* in *die*, *hie*, *lie*, *pie*, *tie*, *vie*; the *y* appears in *dying*, &c. We write *dye*, *lye* to distinguish these words from their homophones; the use of *y* for *i* in *rye*, *scythe*, seems purely arbitrary. The suffix *-y* appears as *-ie* in Scottish writings; hence such forms as *Charlie*, *Nellie*, *Willie*, which are now in general use beside the more normal *Charley*, *Nelly*, *Willy*.

In early Scandinavian the letter was adopted from Old English with the sound of *ü*; it is still so pronounced in Danish, Norwegian, and Swedish, but in modern Icelandic its sound has become identical with that of I. In Welsh it represents two different vowel sounds: the one resembling the *u* in *but*, and the other identical with the Welsh *u*, which has some likeness to the *i* in *pit*. The second of these sounds appears to coincide with that of the Polish and Bohemian Y. In French the letter is (in a few words) a consonant, sounded as in English; its use as a vowel (=*i*) survives in various proper names, in Greek derivatives, and in the word *y* (there); between vowels it stands for a double *i*, as in *rayon*, *aboyer*. In Spanish it is mainly a consonant sounded as in English; but it is substituted for *i* in the word *y* (and), and in diphthongs at the end of words. In Portuguese it occurs only in Greek derivatives (pronounced like I). In Italian it is not used. In German, apart from a few surnames and placenames, which retain the archaic *ay*, *ey* instead of *ai*, *ei*, it survives only in Greek derivatives (pronounced *ü*); similarly in Dutch (but pronounced like I).

In late Latin, after Y and I had become identical in pronunciation, the former letter received the distinguishing name of *I* (or *Y*) *græcum*, i.e. 'the Greek I (or Y).' This survives in the French *y grec*, and also in the Spanish *y griega*, though Spanish has an alternative name *ye*. In German and Portuguese the letter is called by the Greek name *ypsilon*, and in Italian *ipsilon*, or *ipsilonne*. The history of the English name *wī* is very obscure. Its ultimate origin is probably to be found in the fact that Latin speakers, unable to give the Greek letter its correct sound, were accustomed to substitute *ui* as the nearest approximation of which their organs were capable. Many instances are known in which *ui* was used as the rendering of *upsilon* in Latin transliterations of Greek texts or quoted words. The combination *ui*, spoken rapidly, naturally passed into *wi*. Hence, in certain mediæval MSS. (written in France), which contain the Greek alphabet accompanied by the

names of the letters in Latin spelling, we find the name of the letter ϒ given as *wi*. About A.D. 1150 the Icelander Thoroddr says that Y is a Greek letter, which the Greeks themselves call *ui*, but which the Latins pronounce like I. The earliest occurrence of the name in England is in the MS. of the *Ormulum*, written by the author himself about A.D. 1200. Here the Greek form of the name Jesus is given in capitals as IESOϒS, and the symbolic meaning of each of these six letters is then explained separately. Over the letter ϒ is written its name *wi*. This was evidently regarded by the author merely as the name of a foreign letter; he himself never uses Y either in his English text or in his Latin quotations. As the name of an English letter, *wi* first occurs in the *Alphabetum Anglicum*, contained in a 15th-century MS. (Titus Dxviii. fol. 86), but (as the forms of the letters show) transcribed from an original little later than A.D. 1200. At the beginning of the 16th century Gawain Douglas rhymes 'Y' with 'sky.' In A.D. 1552 Huloet, while saying nothing about the English name of the letter, makes the curious remark that the Greeks call it *guy*. In Baret's *Alvearie* (1573) *wy* appears distinctly as the English name, and after this references to it are frequent.

Y, THE. See AMSTERDAM.

Yablonovoi, or YABLONOI, a ridge of mountains in the north-east of Asia, dividing the basin of the Amur from that of the Lena. Some peaks are 7000 feet high. See SIBERIA, ASIA.

Yacht, a vessel for pleasure or racing. When King Robert the Bruce lived at Cardross on the Clyde, 'his chief amusement was to go upon the river, and down to the sea in a ship which he kept for his pleasure.' 'In 1326 six men (his crew) were paid wages of 2s. for crossing in his yacht to Arran.' Queen Elizabeth in 1588 had a royal vessel built at Cowes, Isle of Wight, and every succeeding English sovereign has had yachts. In England the name first appeared in 1660, when the Dutch presented a 'jacht,' named *Mary*, to Charles II., who afterwards had a number of yachts designed and built for him by Sir Phineas Pett. In 1662 he sailed a match for £100 with a yacht of his own called *Jamaie*, against another of Dutch build, sailed by his brother the Duke of York.

The first authentic record of a sailing club is in 1720, when the 'Cork Harbour Water Club'—now known as the 'Royal Cork Yacht Club'—was established. The vessels in these days were small, and from that period till early in the 19th century yachting developed slowly. In 1812, when there were probably fifty yachts afloat, an association similar to the Cork Club was established at Cowes by some yachtsmen. Known as 'The Yacht Club,' it steadily increased in membership and importance. In 1820, having attracted the attention of the Duke of Clarence, afterwards William IV., its name was altered to 'The Royal Yacht Club,' and subsequently to 'The Royal Yacht Squadron,' the title by which it has since been known. Since 1820, and more particularly during the latter half of that century, yachting associations increased in numbers and popularity. There are now many 'royal' and 'recognised' yacht clubs round the coasts of the British Isles. The Royal Thames was founded in 1823; The Royal Northern in 1824; The Royal London in 1838; and the Royal Clyde in 1856. In foreign countries and in British possessions during recent years, yachting has grown in popularity. In America organised yachting dates from about 1844, in which year the New York Yacht Club was founded. The history of this club is practically the history of American yachting, for down to the year 1885 no other club—although the number had greatly increased—attempted much more than local efforts. In squadron-cruising, ocean-racing, and private matches the New York Club has all along taken the lead.

The first Royal Cup for racing-yachts was presented in 1834 by William IV. to the Royal Yacht Squadron, a gift which has been continued ever since by the reigning sovereign, and in recent years supplemented by similar gifts to other clubs.

From the year 1850, when there were only about 500 British yachts afloat, the increase in numbers has been enormous; and the growth in size of individual vessels no less remarkable.

The principal materials used in building yachts are wood, iron, steel, and bronze. Lead has been adopted for ballast in racing yachts, the lead keel forming an integral part of the hull. Speed has been the regulating condition of design in racing yachts, but the proportions, scantlings, and build have varied greatly throughout the course of evolution, from the clumsy build and unpretentious rig of the small craft early in the 18th century to the rakish model and the immense spread of sail of racing yachts at the present time. Prior to the advent in British waters in 1851 of the famous schooner *America* (170 tons) of the New York Yacht Club, the Cutter (q.v.) rig was most favoured by British yachtsmen, especially for racing. But after the brilliant performance of that vessel, in winning a cup presented by the Royal Yacht Squadron for a race round the Isle of Wight, the attention of designers was forcibly drawn to the merits of the Schooner (q.v.) rig. The flat set of her sails was especially novel, and the lesson she taught in the art of setting canvas has never been forgotten. The *America* was a revelation, not only in rig, but in the form and proportions of hull. Up to 1848 development in this country had proceeded on conventional lines of the pilot boat type, but in that year a yacht of an entirely different type was built on the Thames. This was the iron cutter *Mosquito*, of 50 tons, the features chiefly distinguishing her being a long hollow bow and an after-body of considerable fullness—a reversal, in fact, of 'the cod's head and mackerel tail' order of design then being disparaged by Mr Scott Russell, who advocated in its place his 'wave-line theory.' This marked deviation from orthodox lines did not meet with approval, and prejudice was still strong until the success of the *America* shook British yachtsmen out of their complacency. Her model partook of the very features then being advocated, and copies of her design and of the schooner rig became quite the fashion in new yachts, both for racing and cruising. Even existing cutters were lengthened in the bows to give them the hollow form. But the cutter rig has held its own for racing yachts. Since 1864, when the yawl (see SAIL) rig assumed importance, and especially during recent years, the cutter has proved to be the best for racing, except in very large yachts.

American yacht designers have in turn benefited from British example. In 1881 the 10-ton cutter *Madge*, designed by G. L. Watson, was sent across the Atlantic, and it is not too much to say that her performances in American waters established the cutter model in that country on a firm foundation, modifying the American sloop rig and centre-board model. Centre-board yachts are of restricted draught, and to avoid lee-way lateral resistance is obtained by a drop keel or 'centre-board,' fitted to drop below the keel proper. When made of heavy material the centre-board also serves as ballast. A centre-board is usually pivoted at the fore-end, and drops like a fin, and is housed in a well inside the vessel. The idea is

probably taken from the Dutch lee-boards—attached one to each side of flat-bottomed boats, the one on the lee-side being let down to check drifting. The exigencies of American yachting waters favoured the development of the centre-board yacht.

Time allowance became necessary in races where yachts of different sizes and spread of sail were matched together. Then various efforts were made to classify them according to racing rules for measurement, which largely account for fluctuation in design. System in these matters has been, on the whole, attained since 1875, when the Yacht Racing Association was established with the object mainly of providing one code of sailing rules for all matches, and of deciding such disputes as might be referred to the council. For ascertaining the size or tonnage (q.v.) of yachts it adopted the rule which had been in use for a very considerable period, known as the 'Thames Rule.' It was a modification of the 'Builder's Old Measurement' rule, and length and breadth were the only factors. The Thames rule was found to favour length and depth at the sacrifice of breadth, because the absence of restriction on depth and sail area, also the penalty put upon beam, produced a deep narrow type of vessel. These vessels of extreme length and narrowness obtained the necessary stability by enormous lead keels. Such extremes led to modifications, and then to a rule of measurement or 'rating' which took account only of length on water-line and area of sail carried. This left naval architects a freer hand in proportions and ballasting. Girth measurements were introduced in later rules; and now certain limitations in displacement and draught are also provided in the 'International' rating rule, which has been adopted by European countries. Rating rules in America are different, the principal one, which is adopted by the New York Yacht Club, being the 'Universal' rule. But there is now a prospect that American and European clubs will devise a common rule. All rating rules have been subject to much criticism from owners and designers.

International yacht-racing—contests between yachts built and owned in different countries—is one of the most interesting forms which the sport can assume. It may be said to date from 1851, the year of the Great Exhibition, when, as already related, the famous schooner *America* bore away a trophy presented by the Royal Yacht Squadron at Cowes. Commodore Stevens, the owner of the *America*, died in 1856, but by a deed of gift set the cup apart as 'a perpetual challenge for friendly rivalry between foreign countries.' In 1870 the *Cambria*, owned by Mr James Ashbury, made an unsuccessful attempt to bring back the cup to England, as did the same owner's *Livonia* in the following year; the latter vessel being built expressly for the task. The Canadian schooner *Countess of Dufferin* in 1876, the *Atalanta* in 1881, the *Genesta* in 1885, and the *Galatea* in 1886 each made futile efforts to defeat the American representatives. So also in 1887 did the *Thistle*, a steel cutter built on the Clyde for the purpose, from the designs of G. L. Watson, for a syndicate of Scottish yachtsmen. The Americans had, from the designs of Edward Burgess, built the centre-board sloop *Volunteer*, which defeated the Scottish cutter. In 1893, and again in 1895, Lord Dunraven attempted to win the America cup with his *Valkyrie II.*, and *Valkyrie III.* Both these yachts were designed by G. L. Watson. Sir T. Lipton's challenge in 1898 was accepted by the New York Club, and in 1899 the *Shamrock*, designed by W. Fife, raced the American *Columbia*, but unsuccessfully. In 1901 Sir Thomas tried again with *Shamrock II.*, designed by G. L. Watson, but *Columbia* again won. In 1903 his *Shamrock III.*, designed by W. Fife, was beaten by the American *Reliance*, and in 1920 *Shamrock IV.*, designed by C. E. Nicholson, was defeated by *Resolute*. In 1893, and since, all the American defending yachts in these races were designed and built by Nat. Herreschoff. The contests for the British-American Cup, between teams of four 'six-metre' yachts (International rating) each side, have provided further friendly rivalry between the two nations. The first of these took place in the south of England in 1921, and resulted in favour of the British team. The following year the American team was successful, the races taking place in their waters. In 1923 the British team was again victorious, the meeting once more being in the south of England, and the trophy was won when in 1924 the British team was victorious in America. In that year the Sewanhaka challenge cup was brought to the Clyde by the 'six-metre' yacht *Coila*, designed and owned by F. J. Stephen; and she twice successfully defended it before it was taken back to America by the *Lanai*. There have been a number of other international yacht races, but they have never aroused so much interest among the general public as the foregoing.

While the growth, since 1851, of the world's fleet of sailing-yachts has been remarkable, the increase of steam-yachts, and in recent years of motor-yachts, has been still more wonderful, in spite of the antipathy with which power vessels were long regarded by racing yachtsmen. The rapidity with which they have grown into favour for cruising is easy of explanation. Yachts mechanically propelled are independent of wind, and can traverse the sea to any desired point. Large steam and motor-yachts can keep the sea all the year round and go enormous distances, and form comfortable floating-homes.

Warrants are granted to members of clubs to fly the white, blue, or red ensign, when yachts are registered according to the provisions of the Merchant Shipping Act. These warrants carry with them certain privileges. Yachting affords an excellent training for seamen, who may in time of war become available for the navy reserve.

See Dixon Kemp, *Yacht Architecture; Manual of Yacht and Boat Sailing;* E. Burgess, *English and American Yachts;* C. P. Kunhardt, *Small Yachts*, and *Steam Yachts and Launches;* and the annual *Lloyd's Yacht Register;* also the articles BOAT, SHIPBUILDING, &c.

Yajurveda. See VEDA.

Yak (*Bos grunniens*), a species of ox found in Tibet, and domesticated there. The wild yak of central Asia is the largest native animal of Tibet, and is found only near the limits of perpetual snow, descending into the higher wooded valleys in winter, and ascending in summer to the pastures of short grass, some of which are at an elevation of 17,000 feet above the sea. It is very fierce, falling upon an adversary not only with its horns but with its chest, and crushing him by its weight. The domesticated yak, which forms great part of the wealth of the inhabitants of the highest and coldest regions of central Asia, is about the height of an English ox, which it much resembles also in body, head, and legs; but it is covered all over with a thick coat of long silky hair, that of the lower parts of the body being very long and hanging down almost to the ground. The neck is short; the rump is low; the legs are short. Over the shoulders there is a bunch of long hair; and the tail is covered with a prodigious quantity of long flowing hair. Black and white are the most prevalent colours. The great quantity of hair gives the

yak an apparent size far beyond the reality. Its characters seem to bridge over the gulf—not a very wide one—between the sheep and oxen. The yak does not low like an ox, but utters a short grunting sound. Its milk is very rich, and yields ex-

Yak (*Bos grunniens*).
(From a Photograph by Gambier Bolton, F.Z.S.)

cellent butter and curd. The yak is never used for tillage or draught, but as a beast of burden travels twenty miles a day. The hair is spun into ropes, and made into coverings for tents; the soft fur on the hump and shoulders is made into a fine and strong cloth.

Yakub Beg. See KASHGAR, TURKESTAN (EASTERN).

Yakub Khan. See AFGHANISTAN.

Yakutsk, capital of the Yakut republic in Eastern Siberia, on a branch of the Lena, and about 4 miles from the main stream. It has a cathedral and several churches, and there are a few merchants trading in hides, furs, and mammoth tusks. Pop. 7300. The dreary Yakut republic consists of the basin of the Lena River and several others in east and west. It covers over a fourth of Asiatic Russia. Pop. 288,200. The Yakuts (see SIBERIA) are of Turkish stock.

Yale, LINUS (1821–68), American inventor, turned his attentions from portrait-painting to the devising of door-locks, and won a universal reputation. See LOCK.

Yale University, one of the leading institutions of learning in America, situated at New Haven, Connecticut, was founded at Saybrook in 1701 as the collegiate school of the colony, under the trusteeship of the ten principal ministers, and in 1718, when it was removed to New Haven, named after Elihu Yale (1649–1721), a Boston (Mass.) man, who had been governor of Fort St George, Madras, acquired great wealth, and sent the young institution gifts of money and books to the extent of £800. The name Yale College, applied at first only to the new building, was given formally to the institution in its charter of 1745. A chair of divinity was added in 1755, one of mathematics, physics, and astronomy in 1771, and one of chemistry and natural history in 1803. Occasional grants were made by the legislature before the Revolution, and $30,000 was voted by the state in 1792. Schools of medicine (1812), theology (1822), and law (1824) were established. The 19th century was a period of extension and development, and Yale was recognised as a university by the state legislature in 1887; now the university also possesses departments of philosophy and arts, the latter including, besides the classical course of 'Yale College' proper, the Sheffield Scientific School (begun 1847, endowed 1869), a graduate school (1871), schools of fine arts (1864), music (1894), forestry (1900), and nursing (1923), and an observatory (1871). The schools of the university are organised under the four faculties of arts, theology, medicine, and law. The three main libraries, the oldest of which was organised in 1843 independently of the other departments, contain about 1,400,000 volumes, some of them (such as the Elizabethan Club's library of Shakespeare's quartos and folios) of great interest and value. The new Peabody Museum contains important geological, zoological, and other collections; and the School of Fine Arts, amongst other things, the Trumbull (q.v.) paintings. The buildings of the university, over sixty in number, are in the heart of the city, and were extended during the bi-centenary celebrations of 1901 and afterwards, numerous important laboratories having been added. Among presidents were Thomas Clap, Timothy Dwight, T. D. Woolsey, Noah Porter, a second Timothy Dwight (grandson of the earlier one), and Hadley; the two Sillimans were professors. The university corporation, which still includes its clerical representatives—the successors of the original ten—is the governing board which confers degrees. The teaching body numbers 370, and the students 4700.

Yalta, renamed KRASNOARMEISK, a town and health resort on the south coast of the Crimea. Pop. 26,000.

Yalu, another name for the Am-nok River bounding Korea (q.v.).

Yam, a name given to the cultivated species of Dioscorea, a genus of Dioscoreaceæ, mostly tropical, natives of the West Indies, Polynesia, China, &c. The great fleshy tubers of some of them are very much used as food; they contain much starch, and generally become somewhat mealy and pleasant to the taste when boiled. This, however, is not the case with all: the tubers of several species with compound leaves are very nauseous, even when boiled, and are poisonous. The tubers of all the yams contain an acrid substance, which, however, is dissipated by boiling, except in the species with compound leaves. The tubers of the Winged Yam (*D. alata*) of eastern Asia and all tropical regions are 1½ to 3 feet long, and often 30 lb. in weight, with a brownish or black skin, juicy and reddish within; they vary exceedingly in form. The stem, which is winged, twines up tall poles. Two or three small tubers are generally found in the axils of the leaves. It is supposed that this species may be the original of most, or perhaps all, of the yams cultivated in the tropical parts of Asia, Africa, and America, such as *D. bulbifera*, in which the tubers in the axils of the leaves attain the size of apples. Yams are propagated by means of their tubers; the small axillary tubers, or the small tubers produced at

Yam:
a, a flower; *b*, root.

the base of the stem around the neck of the large tuber, being used for this purpose. A species of yam (*D. batatas*) brought from the temperate parts of China and Japan is found to succeed well in France. It is hardy enough to endure the climate even of Scotland without injury; but the heat of summer is not enough, so that, in general, the plant merely lives, without producing a large tuber. The stem requires the support of a pole, round which it twines; the leaves are more elongated and acuminate than those of the West Indian yams; the tuber is formed often at a very considerable depth; this may be prevented by putting a slate under it. The other important species are *D. esculenta* (tropical Asia, Papua, Polynesia) with tubers reaching 80 lb.; *D. abyssinica* (East Africa; indigenous to Abyssinia but not cultivated there); *D. occidentalis* (West Indies); *D. cayenensis* (tropical America, West Africa); *D. triphylla*, var. *dumetorum* (West Indies, tropical Africa). A few others are locally cultivated as *D. globosa* with several varieties in India, notable for the fragrance of its flowers; *D. triloba* in America; *D. aculeata*, the Prickly Yam, in India. Of the poisonous species *D. tokoro* is used in Japan to poison fish, and several others are used in Malaya for arrow-poison. For the sub-genus (or genus) Testudinaria, to which belong *D. elephantopus*, *D. Marlothii*, and *D. montana*, see HOTTENTOT'S BREAD. The true yam is little cultivated in the United States, where the name is often given to the Sweet Potato (q.v.). See also COCCO.

Yamen. See YEMEN.

Yanáon (Yánám), a small patch of Indian soil belonging to France, and under the governor of Pondicherry, forming a small enclave surrounded by British territory (province of Madras), with 5 sq. m. of area and 5000 inhabitants. It lies near the mouth of the Godavari, between the main stream and its branching mouth, the Coringa.

Yanbu', or YEMBO, the port of Medina; pop. 3000.

Yang-tsze-kiang (better simply *Kiang* or *Chiang*), the longest and most important of Chinese rivers, affording a waterway, not unbroken by rocks and rapids, across the breadth of China from Tibet to the sea, rises in the mountains of Tibet, where its sources were explored by Prjevalsky in 1884–85, and after a course of 3200 miles (south-east, north-east, and east) through Yunnan, Sze-chwan, Hu-pei, An-hui, and Chiang-su, reaches the sea by a wide estuary which begins 50 miles below Nanking, and may be held to terminate near Shanghai. On its banks are, besides Nanking, the important towns of Chin-kiang, Ngan-king, Hankow, Wu-chang, Ichang, Wan-hsien, and Chung-king. Some of its many tributaries are over 1000 miles long; its basin is estimated at 689,000 sq. m. Its importance for commerce is enormous, though the navigation is in places difficult even for native boats. Steamers and motor-vessels are now running. The treaties of 1898–99 recognised the basin of this river as open to English commerce. See CHINA, and books by A. J. Little (1888; 3d ed. 1898) and D'Outreman (1911).

Yanina. See JANINA.

Yankee, the popular name for a New Englander in America, 'at the south' for a Northerner, and in Great Britain often applied indiscriminately to the whole population of the United States, used to be thought a corruption of the word English as pronounced by the Indians (Yenghies, Yanghies). It was in use in Boston about 1765, but circulated in Cambridge slang in 1713. Togemann, followed by Jespersen (in *Growth and Structure of the English Language*, 1906), says the people of New Amsterdam (now New York) were called *Jan Kees*—a term applied in old Flanders to persons from Holland. *The New English Dictionary* inclines towards Dutch *Janke*, diminutive of *Jan* (John). For 'Yankee Doodle,' see NATIONAL HYMNS.

Yankton, capital of a county of that name in South Dakota, and prior to 1883 capital of the territory of Dakota, stands on the north bank of the Missouri, nearly 200 miles above Omaha, and 569 miles by rail W. by N. of Chicago. It has flour, cement, and other industries. Pop. 5000.

Yap. See CAROLINE ISLAND.

Yapock (*Chironectes palmatus*), a peculiar aquatic marsupial of the Opossum family, Didelphyidæ, the only known species of its genus. It occurs from Guatemala to southern Brazil. Its food consists of small fishes, crustaceans, and the like. The feet are webbed in adaptation to the aquatic habits. In size the yapock is rather larger than a rat; the general colour is light gray crossed by transverse bars of brown.

Yard (O.E. *gyrd*, *gierd*, 'rod'), the British standard measure of linear dimension (see WEIGHTS AND MEASURES). Yard and Ell (q.v.) are often, but erroneously, treated as identical. The military pace is 2½ feet.

Yarkand, the commercial capital of Eastern Turkestan, on the Yarkand or Zerafshan River, about 100 miles SE. of Kashgar; pop. 100,000. It was visited by Marco Polo, but was hardly known till R. Shaw in 1871 published an account of his residence there three years before. The oasis in which it stands is very fertile, and there is great wealth of minerals in the mountains within view of it. See TURKESTAN and books cited there.

Yarmouth, GREAT, a municipal, parliamentary, and county borough, seaport, watering-place, and fishing-town of Norfolk, 20½ miles E. of Norwich and 122 NNE. of London. It stands on a slip of land 1½ mile broad, which is washed on the west by Breydon Water, and on the east by the North Sea. In 1890 the Suffolk suburb of Gorleston with Southtown was incorporated with Yarmouth, making it coincident with the parliamentary borough. The main streets are intersected by 145 narrow 'rows.' The sea front has fine gardens and marine parade, with the Wellington and Britannia Piers (1854–58), and the Old Jetty (1808). St Nicholas' Church, founded in early 12th century by Bishop Losinga, and restored in 1847 and completed in 1891, is one of the largest parish churches in the kingdom, measuring 236 feet in length, 112 in breadth, and 148 across the transept, with a modern spire 168 feet high; a feature of its churchyard is the number of gravestones to drowned mariners. The Nelson Monument (1818) is a Doric column 144 feet high; and one may also notice the town-hall (1882), old tollhouse (13th century) with library and museum, covered fish-market (1867), sailors' home (1860), Royal Aquarium (1876, now a theatre), royal military hospital (1809), militia barracks, spacious market-place, race-course and golf-links, observation tower 130 feet high, some remains of the old walls and towers. Yarmouth, the second largest town in the county, is the principal seat of the English herring-fishery; its 'bloaters' are famous of old. Deep-sea fishing is also carried on, and there is considerable shipping, the present harbour-channel of the Yare having been formed in 1559–67, whilst in Yarmouth Roads, inside a line of sandbanks, there is safe anchorage. The exports include fish and agricultural produce; shipbuilding is carried on, and iron, ropes, sails, nets, and twine are manu-

factured. The town, too, owes much of its well-being to its attractions as a lively watering-place. None of its worthies is more famous than 'Peggotty'; in its history may be noticed its feuds with the Cinque Ports, the plague of 1338–39, which cost 7000 lives, and the fall of a suspension bridge (1845), when seventy-nine persons were drowned. Chartered by King John, it returned two members to parliament from Edward II.'s time till 1867, and since 1885 one member; in 1888 Great Yarmouth was created a county borough. Pop. (1881) 46,767; (1911) 55,905; (1921) 60,700.

See works by H. Manship (compiled 1619, and published, with continuation by C. J. Palmer, 1854–56), C. J. Palmer (*Perlustration of Great Yarmouth*, 3 vols. 1872–75), J. G. Nall (1866), W. F. Crisp (1871), and others cited at NORFOLK; also M. A. Castle's *History of the Yarmouth Battery* (1927).

Yarmouth, a small seaport in the north-west of the Isle of Wight, 10 miles W. of Newport. It was once an important fortified place, and till 1832 sent two members to parliament.

Yarn. See COTTON, WOOL, THREAD, &c.

Yaroslav. See JAROSLAV.

Yarrell, WILLIAM, naturalist, born at Westminster in June 1784, was originally a newspaper agent, but, a keen sportsman, soon devoted himself to zoological work, contributing largely to the Transactions of the Linnean and other societies. He died 1st September 1856. His chief works are *The History of British Fishes* (2 vols. 1835–36) and *The History of British Birds* (3 vols. 1839–43).

Yarrow, a Scottish stream famous in song and ballad, that rises at the meeting-point of Peebles, Dumfries, and Selkirk shires, and flows 25 miles north-eastward till it joins the Ettrick, 2 miles above Selkirk town. About 5 miles from its source it expands into first the Loch of the Lowes (1 by ¼ mile) and then St Mary's Loch (q.v.), the two being separated only by a neck of land on which stands Tibbie Shiel's hostelry. Under SELKIRKSHIRE have been noticed a few of the many memories of that hill-girt lake and the deep swirling stream; and reference may be also made to BALLAD and to Borland's *Yarrow, its Poets and Poetry* (1890).—The plant usually known as Milfoil (q.v.) is in some parts of England and everywhere in Scotland called Yarrow.

Yass, a town of New South Wales, 46 miles WSW. from Goulburn. See CANBERRA.

Yassy. See JASSY.

Yates, EDMUND, journalist and novelist, was born at Edinburgh, 3d July 1831, the son of the actor Frederick Henry Yates (1797–1842), who from 1825 was manager of the Adelphi Theatre. He was educated at Highgate and Düsseldorf, was from 1847 till 1872 in the Post-office, latterly as chief of the missing-letter department, and died 19th May 1894. He published upwards of a score of novels and other works (*Broken to Harness, Running the Gauntlet, Black Sheep,* &c.), was editor of *Temple Bar, Tinsley's,* and other periodicals, and in 1874 founded, with Grenville Murray (q.v.), a very successful 'society' weekly, *The World,* of which next year he became sole proprietor, and which, for a libel on Lord Lonsdale, involved him in 1884 in two months' imprisonment. See his lively *Recollections* (2 vols. 1884), with anecdotes of Dickens, Thackeray, Albert Smith, &c.

Yawl. See SAIL, YACHT.

Yawning either may be the simple result of deficient aeration, or may be brought on by the mere sight of the act in another person, and is a modification of the ordinary movements of respiration, in which the inspiration is deeper than usual, and is accompanied by a kind of spasmodic contraction of the muscles which depress the lower jaw, and by a great elevation of the ribs and to some degree of the shoulder-blades. 'The purely involuntary character of the movement,' says Dr Carpenter, 'is sometimes seen in a remarkable manner in cases of palsy, in which the patient cannot raise his shoulder by an effort of the will, but does so in the act of yawning. Nevertheless, this act may be performed by the will, though not completely; and it is one that is particularly excited by an involuntary tendency to imitation, as every one must have experienced who has ever been in company with a set of yawners.'

Yaws is a disease also called Framboesia; Button Scurvy; Buba or Boba, and Patta (West Indies); Framosi (Calabar); Tetia (Congo); Tonga or Coco (Fiji); Lupani and Tono (Samoa); Fr. and Ger. Pian. It is an epidemic and contagious disease, accompanied by fever and muscular pains at first, and consisting of an eruption of yellowish or reddish-yellow tubercles, which gradually develop into a moist exuding fungus without marked constitutional symptoms, or with such only as result from ulceration and prolonged discharge—i.e. debility and prostration. Incubation varies from three to ten weeks, and yaws usually only occurs once in the same individual. Yaws is distinctly a tropical disease, and is very infectious either from person to person, from infected houses, or through the medium of flies. The infecting organism appears to be a spirochaete (*Treponema pertenue*) closely resembling but differing from that of syphilis. Negroes chiefly suffer from it, but no race is exempt. In Africa yaws is found on the west coast from Senegambia on the north to Angola in the south. It obtains all over the western Sudan, and is more rarely seen in the Nile valley and on the northern and north-eastern African coast-line. It is found in Madagascar, Mozambique, in the Moluccas, Java, and Sumatra. It is also endemic in Ceylon, New Caledonia, Fiji, and Samoa; and in the west Indies in San Domingo, Jamaica, Barbados, Martinique, Guadaloupe, Sta Lucia, and Dominica. It exists all over Brazil and in Guiana; also at Punta Arenas in Costa Rica. The duration of the disease is from two to six months, but if neglected it may last for several years. If the course of the disease is protracted, the joints are apt to swell, and ulcers form around them, from which an excessive discharge rapidly undermines the patient's strength. The treatment consists of tonics, iodide of potassium, and a generous diet. The patient must be kept very clean, and local antiseptic dressings must be applied to the ulcers. Salvarsan or other arseno-benzol preparation has a powerful and rapid influence over the disease. It must be remembered that the condition is infectious and measures must be taken for isolation and cleanliness of the affected.

Ya'zoo City, capital of Yazoo county, Mississippi, on the Yazoo River (a tributary of the Mississippi), 45 miles by rail N. by W. of Jackson; pop. 5000. For Yazoo Bottoms, see MISSISSIPPI.

Yeadon, a town of the West Riding of Yorkshire, England, on the Aire, 6 miles NW. of Leeds by rail, with woollen manufactures. Pop. 7600.

Year. The origin of this division of time, its duration, and the history of its changes are discussed under CALENDAR. For the ecclesiastical year, which in Europe generally commenced on 25th March, see CHRONOLOGY. In Astronomy there are several kinds of years depending upon the various configurations of the earth in its orbit, and consequently varying in length. First there is the *tropical* or (as it is sometimes incorrectly called) *solar* year, which, from its being recognised

in legislation and history, and commonly applied in the measure of time, has also received the name of *civil* year. This year is defined as the time which elapses from the sun's appearance on one of the tropics to its return to the same, and has a mean length of 365·2422414 mean solar days, or 365 days 5 hours 48 minutes 49·7 seconds. Next is the *sidereal* year, which is the period required by the sun to move from a given star to the same star again, and this year, affected as it is by Nutation (q.v.) only, is one of the most invariable quantities which nature presents us with, and has a mean value of 365·2563612 mean solar days, or 365 days 6 hours 9 minutes 9·6 seconds. The time which elapses between the earth's arrival at its Perihelion (q.v.) and its return to the same position is known as the *anomalistic* year, and is equivalent to 365·2595981 mean solar days, or 365 days 6 hours 13 minutes 49·3 seconds. The *canicular* year—the ancient Egyptian—was counted from one heliacal rising of Sirius to the next. The canicular cycle was the cycle of 1461 years of 365 days each, or 1460 Julian years, also called the *Sothiac* period.

Yeast, the vegetable growth to which Fermentation (q.v.) is due, of value in brewing, baking, &c. See BEER, BREAD, SUGAR, WINE; also SACCHAROMYCETES.

Yeats, WILLIAM BUTLER, born in 1865 the son of the Dublin and New York artist, John Butler Yeats (1839–1922), studied painting, but in 1888 settled in London and took to literature. Much influenced by his reading of old Irish literature and his familiarity with peasant folk-lore and legend, and coming, too, under the spell of Blake, Shelley, and the French symbolists, he published several collections of poems and Irish tales, edited Blake, and became a champion of the Neo-Celtic movement represented by the Irish Literary Society and the Irish Literary theatre. In his articles, tales, dramas in verse and in prose, there is a mystical, dreamy, individual, and poetical charm, a charm that is not lessened when the vivid, often extravagant, imagery of his earlier work gives way to the more sage and sober simplicity of his later writings. He became a senator in the parliament of the Irish Free State in 1922, and was awarded the Nobel prize for literature in 1923. His chief works are *The Wanderings of Oisin* (1889), *The Countess Kathleen* (1892), *The Celtic Twilight* (1893), *Poems* (1895), *A Book of Irish Verse* (1895), *The Wind among the Reeds* (1899), *Cathleen ni Hoolihan* (1902), *Ideas of Good and Evil* (1903), *Deirdre* (1907; the best known of his plays), *Plays for an Irish Theatre* (1912), *Reveries* (1916), *The Wild Swans of Coole* (1919), *The Trembling of the Veil* (1922), *A Vision* (1926). A collected edition of his works in 8 vols. was published in 1908 *et seq.* and another one in 1923 *et seq.* See H. S. Krans, *W. B. Yeats and the Irish Literary Revival* (1904), a bibliography by A. Wade (1908), and a study by F. Reid (1915).

Yedo. See TOKYO.

Yeisk, or EISK, a port of the Sea of Azov, in the North Caucasian area; pop. 50,000.

Yekaterinburg. See EKATERINBURG.

Yeletz. See JELETZ.

Yellala Falls, the lowest of a series of falls or rapids which interrupt the navigation of the Congo (q.v.) near Vivi, 110 miles from the mouth.

Yellow Fever is also known as Yellow Jack, Bronze John, El Vómito (Span.), Fièvre Jaune (Fr.), Gelbes Fieber (Ger.), Vómito Prieto (Central America). It is a pestilential, contagious fever of a continuous and special type, presenting at least two well-defined stages, the first occupying 36 to 150 hours, marked by a rapid circulation and high temperature, the second being characterised by general depression and black vomit; as a rule it occurs but once in the same individual. The natives of an area where it is endemic have a certain amount of immunity from attack or contract the disease mildly; while strangers, even negroes from a healthy district, are peculiarly liable to severe attacks. New arrivals in an endemic area are most liable to contract the disease; should they escape it at first, they are less liable to suffer from it the longer they reside in one place; should they, however, travel about, they lose what protection they may have gained. The area of distribution of yellow fever is limited. Its endemic areas are on the seacoasts and along the banks of the great rivers in the West Indies, on the Mexican part of the Gulf coast, and on the Guinea coast of Sierra Leone. Epidemics, however, may extend from these foci, but their distribution is limited in Africa to the west coast, from 19° N. to a point on the mainland opposite Fernando Po; in the western hemisphere, from 38° N. to 32° S. lat.—though on the western shores of South America epidemics have occurred from 5° S. to 42° S. They also occur throughout the whole of the West Indies. For the production of yellow fever a dense population is necessary, as also a temperature of above 70° F., a moderate amount of moisture in the atmosphere, and a low altitude. An epidemic of yellow fever will be cut short if the temperature falls to freezing-point, and abundant rains frequently bring an epidemic to an end. As a rule yellow fever does not ascend higher than 3000 feet above sea-level. Elaborate researches carried out by Drs Reed, Carroll, Agramonte, and others, have shown that in the first place infection is not conveyed by clothing, dejecta, &c., nor even directly communicated by patients suffering from the disease, as used to be supposed. Like malaria, the infective material—a protozoan organism *Leptospira icteroides* is carried by a *Stegomyia* mosquito, in the body of which it undergoes a process of development. The incubation period is usually 4 or 5 days but may be 13. After the lapse of these the patient is suddenly attacked by severe rigors, alternating with flushes of heat. There is violent headache, the pulse is regular but throbbing, thirst is usually severe; the tongue, coated in the centre, presents a red edge, and deep-seated pain at the back of the eyeball is almost invariably complained of. Constipation, which obtains throughout the disease, should be noticed, and the patient vomits at short intervals. The skin assumes a yellowish or livid colour, and is covered by cold perspiration. The urine is acid and contains a large amount of albumen. The respirations are frequent, and the temperature is about 105° or 106° in the axilla. On the third or fourth day the vomiting becomes more distressing, the urine is scanty or may be suppressed, the temperature rises still higher, and the skin grows harsh and dry. The skin becomes exceedingly yellow, and may be even the colour of mahogany. The face is flushed, the conjunctivæ injected, and the eyes are protruded. The vomited matter at this time may be bilious, but is not great in amount. The patient is very distressed and often delirious.

At this point the condition of the patient will improve somewhat, and in rare cases convalescence may set in, but as a rule the improvement only lasts from eight to twenty hours, during which period all untoward symptoms subside, with the exception of a certain amount of gastric irritation. If these favourable symptoms do not continue, the

patient sinks into a state of extreme prostration; pains in the head, the orbits of the eyes, the loins, and joints return, the pain in the stomach being so severe that the patient can hardly endure the weight of the bedclothes. The tongue becomes parched and gray, the gums and teeth black with sordes, the lips dry, brown, and bleeding, and then the terrible 'black vomit' (*vómito negro*) sets in. At first it may be of a bright red colour, but it soon becomes a deep brownish black. The patient may vomit thirty or more times in the twenty-four hours. This characteristic vomit is produced by severe irritation. The disease may terminate in various ways, the mortality varying from 10 to 70 per cent. Death may result from the direct action of the poison upon the blood and nervous system, or from suppression of the functions of the liver or kidneys, from syncope due to fatty degeneration of the heart, or from hæmorrhage. In rarer cases pyæmia may ensue and the patient succumb to blood-poisoning.

The treatment of yellow fever may be considered under two heads: (1) prophylactic; (2) curative. During an epidemic persons who are not immune should quit the locality affected; sailors should not be allowed on shore; and all persons should be careful to maintain the health at as high a standard as possible. Sufferers from yellow fever are infectious only during the first three days of the attack, and during these they should be carefully screened by wire-netting, &c., from access of mosquitoes. If a case has occurred on a ship or in a house this with the people in it must be kept in quarantine for 13 days after all mosquitoes have been destroyed. By dealing with the mosquitoes and sanitary precautions, the Americans have almost completely freed Havana from a plague that had been endemic for centuries, killing a fourth of the inhabitants; till 1898 the fever was never out of Cuba. Many sanitary authorities are confident that the world will soon be rid of this scourge. As to *curative treatment*, the patient should be kept recumbent in bed; draughts should be avoided, and the temperature should be carefully regulated; the patient should be warmly but lightly clad. Symptoms must be combated as they arise; quinine is useless unless malaria should complicate the fever. At the very onset of the fever a smart purge either by castor oil or by calomel is very beneficial, but is too weakening after the second day of the disease. Very hot baths or hot-air baths relieve the headaches and the congestion of the kidneys if the latter are much affected. On the other hand, if the fever runs very high, cold baths are preferable. Various soothing medicines, sucking of ice, and mustard leaves over the stomach, relieve the vomiting. A favourite method of treatment consists in the administration every hour of water containing a dose of alkali (bicarbonate of soda) with a small dose of perchloride of mercury. This has the effect of lessening the acidity and checking fermentation in the contents of stomach and bowels. The diet must be light and nutritious, and should be given in small quantities at regular intervals throughout the disease. It should consist of chicken-broth, beef-tea, corn-flour, barley-water, or iced milk and lime-water, all solid food, even bread, being best avoided. During convalescence the bowels must be kept open, light and nourishing diet with small doses of brandy should be given, or if preferred, the patient may take port wine. If during the course of yellow fever the prostration is very great, alcohol will be necessary, but in moderation; champagne is the best form in which to administer it.

Yellow-hammer, or YELLOW-BUNTING (*Emberiza citrinella*), a species of Bunting (q.v.), common in the British Isles, most parts of Europe, and Asia Minor and Persia. It is of a somewhat short, thick form, about 6½ inches in entire length. The male's summer plumage is brilliant, bright lemon yellow (especially on head, cheeks, chest, &c.), contrasting with chestnut and dusky black. The tail is slightly forked, and is shorter than that of the common bunting. The female has much less yellow about the head than the male, and her plumage is altogether much less vivid. The bird's food consists of insects, blackberries

Yellow-hammer (*Emberiza citrinella*), with Nest and Eggs.

and other wild fruits in summer, and seeds and grain in winter. It generally makes its nest on or near the ground, under shelter of a bush or a bank, forming it of moss, dry grass, and hair. The song of the male is very sweet, and consists of few notes which have been jocularly set to the words, '*Little-bit-of-bread-and nō chē-ēse.*' He is remarkably attentive to his mate, and takes his turn in incubation. Two or even more broods are reared. In Italy great numbers of yellow-hammers are caught, and fattened like ortolans for the table. The name is a corruption of yellow-ammer—the Old English *amore* (cf. Ger. *Ammer*). In Scotland the yellow-hammer is known as the Yoldrin or Yite.

Yellow Pigments. For artistic work in oil yellow ochre (see OCHRES), raw sienna (a native earth), cadmium yellow (cadmium sulphide), aureolin (a compound of cobalt and potassium nitrites), lemon yellow (barium chromate), and Naples yellow (basic lead antimoniate) are all permanent; but cadmium yellow and aureolin, which require to be carefully prepared, have a tendency to injure a few other colours when mixed with them. Gamboge (q.v.) and Indian yellow (prepared in India from cows' or camels' urine) are beautiful pigments, transparent or translucent, and much used in water-colour painting, but also to some extent as oil-colours. They have both, however, a decided tendency to fade. The other pigments named above are likewise used as water-colours, and are permanent, except Naples yellow, which is unsuited for water-colour painting. Cadmium and lemon yellows are opaque colours, or at least are so to a considerable extent. House-painters use yellow ochre and chrome yellow (chromate of lead) largely. The latter is of a more lively hue than the former, but it is not nearly so durable. Raw sienna is much used for graining painted wood to imitate oak. Yellow lakes, which include brown pink and Italian pink, are beautiful but fugitive colours. They are generally prepared from quercitron bark, but sometimes from Persian berries.

Yellow River. See HOANG-HO.

Yellow Sea, or WHANG-HAI, an important inlet of the Pacific Ocean, washes the north part of the east coast of China, and lies between the Chinese

provinces of Shan-tung and Chiang-su on the one hand and Corea on the other; it terminates on the north-west in the Gulf of Pe-chi-li, and opens out in the south-east into the Tung-hai, or Eastern Sea. By degrees it is becoming shallower owing to the quantity of alluvium borne down into it by the rivers Hoang-ho (q.v.) and Yang-tsze (q.v.).

Yellowstone, the largest affluent of the Missouri River, rises high up in the Rocky Mountains in Wyoming, about 44° N. lat. and 109° 35′ W. long., flows 25 miles north-west to the mountain-girt Yellowstone Lake (22 miles long, 7788 feet above sea-level), thence northward through the National Park into Montana, partly through stupendous cañons, and then east-north-east and north-east to the Missouri, on the western border of North Dakota. It is some 1300 miles long, and is navigable for steamboats 300 miles, to the mouth of the Big Horn, its largest affluent.

The *Yellowstone National Park* occupies the extreme north-western corner of Wyoming, and occupies an area about 75 miles square. Its area was originally 3575 sq. m., but congress in 1891 added a tract of nearly 2000 sq. m. to the south and east—nearly all more than 6000 feet above sea-level, and rising in the snow-covered mountains to 10,000 to 14,000 feet. Situated on the 'Great Divide,' 'its pine-clad mountains form the gathering-ground for the head-waters of large rivers flowing away to the Atlantic and Pacific oceans;' and for the sake of the rainfall and the rivers its forests are carefully preserved. The region is remarkable as well for its scenery as for its famous hot springs and geysers. The river has two falls about 15 miles below the lake, the lower one a magnificent cataract 330 feet in height; then it passes through the Grand Cañon (20 miles), and receives Tower Creek, which itself has leapt out of a deep and gloomy cañon known as Devil's Den over a beautiful fall of 156 feet. Near the river are many of the hot springs, those of White Mountain, near the northern boundary of the Park, extending for 1000 feet up the sloping side, and their snow-white calcareous deposits standing like a series of great frozen cascades. The semicircular basins, in which the water gathers in pools, and from one to another of which it flows over with gradually lessening temperature, are bright with bead-like tracery of scarlet, yellow, orange, and green on the white groundwork—the colours being nearly always due to the presence of certain coloured algæ that live in waters of high temperature, and by whose instrumentality the great siliceous and calcareous sinter deposits have been built up. A few miles from Sulphur Mountain, with its vapours rising from fissures and craters, is the active Mud Volcano, with a crater 25 feet in diameter. The hot springs of the Park number several thousands. But the most singular feature of the region is its geysers (see GEYSER, and illustration there), the most magnificent in the world. These are found principally on the Firehole River, a fork of the Madison, at the western end of Shoshone Lake, and in the Norris basin, to the north of that on the Firehole. The region was visited and described by surveyors in 1869, and explored and mapped in 1871. In 1872 congress dedicated and set it apart 'as a public park or pleasuring ground for the benefit and enjoyment of the people.' At the same time it provided against the wanton destruction of fish and game, or their capture or destruction for merchandise or profit; and, as a happy result of this enactment, several hundred bisons and some thousands of elk, antelopes, Rocky Mountain sheep, bears, &c., have found a refuge within the Park. A branch of the Northern Pacific Railway extends to the northern boundary of the Park.

Yellow Wood. See FUSTIC, SATIN-WOOD, ZANTHOXYLUM.

Yemen, a coastal region of SW. Arabia on the Red Sea. The name is loosely used to denote the area made up by the emirate of Asir, Aden and the Aden protectorate, and the imamate of Yemen proper, but more strictly it applies to the last of these. Yemen was a Turkish vilayet till 1918, when it gained its independence under its Imam Yahya Hamid al Din. It stretches from the Aden boundary in the south to Nejran in the north; its area is some 75,000 sq. m., and its population from 700,000 to 3,000,000. The chief town is San'a (20,000), and there are numerous other towns of considerable size. Mocha (q.v.) was once renowned for its export of coffee. Dhamar (5000) is an ancient seat of learning. El Jebel plateau is very fertile, and the country, with settled rule, may become of commercial importance. The chief products are barley, wheat, millet, coffee, sesame, gum, pearls, and hides. See ARABIA, SABÆANS.

Yenikale. See KERTCH.

Yenisei', one of the largest rivers of Siberia, formed by the junction of the Shishkit and Beikhem, which rise in the mountains on the southern border of Siberia. It flows north through the centre of Siberia into the Arctic Ocean, forming at its mouth a long estuary, and has a total course of about 3200 miles. It is navigable 1850 miles to Minusinsk. Its chief tributaries are the Angara or Upper Tunguska from Lake Baikal and the Lower Tunguska. For the navigation, &c., of the Yenisei, see SIBERIA, and KARA SEA. See too Henry Seebohm's *Siberia in Asia: a Visit to the Valley of the Yenesay* (1882); Nansen, *Through Siberia* (1914); Miss Haviland, *A Summer on the Yenisei* (1915).

Yeniseisk, a town of Eastern Siberia, in the province of Yeniseisk, whose capital, however, is Krasnoiarsk. Yeniseisk stands on the Yenisei River, has a pop. of 10,000, and a good deal of trade, depending largely on the gold and other mines of the district. The Siberian railway route passes through Krasnoiarsk. For the inscriptions found in this region, see *Les Inscriptions de l'Ienissei* (Helsingfors, 1889).

Yeoman, a term applied in early English history to a servant or attendant of good standing in a noble or royal household, but after the 15th century to a class of small freeholders, forming the next grade below gentlemen (see FRANKLIN). The term yeoman was also given to the forty shilling freeholder (see PARLIAMENT) or, more loosely, to any small farmer or countryman above the grade of labourer. The term is also familiar in the titles of functionaries in royal households, such as Yeoman Usher of the Black Rod, Yeoman of the Robes, &c.

YEOMAN OF THE GUARD, a veteran company, consisting of old soldiers of stately presence, employed on grand occasions in conjunction with the gentlemen-at-arms as the bodyguard of the sovereign. These yeomen were constituted a corps in 1485 by King Henry VII., and they still wear the costume of that period. Armed with partisans, and in their quaint uniform, the men present a singularly picturesque aspect. The officers of the corps are a captain (ordinarily a peer), a lieutenant, and an ensign—all old army officers. The whole charge is borne by the sovereign's civil list. The Beef-eaters (q.v.) or warders of the Tower are an entirely different corps, but since the reign of Edward VI. wear the yeoman's uniform, without the shoulder-belt. See works by Preston (2d ed. 1887) and Hennell (1904).

Yeomanry, a volunteer force of cavalry for defence in Britain, was formed during the wars of

the French Revolution, and till 1814 comprised infantry also. The organisation was by counties under the lords-lieutenant. Troops were raised and drilled locally, and assembled by regiments for eight days' training annually. The men provided their own horses and uniform, and received annually a clothing allowance of £2 per man, and, during the annual training, 2s. per day for forage and 7s. daily subsistence allowance. They were liable to be called out in aid of the civil power. During the Boer war (1899–1902) many of the yeomanry volunteered for service in South Africa and formed the nucleus of a force of Imperial Yeomanry, and in 1900 the whole force was reorganised under that name. The force, which then numbered about 25,000, was in 1908 transferred to the Territorial Force as the Cavalry branch. See VOLUNTEERS AND TERRITORIAL ARMY.

Yeovil, a municipal borough of Somerset, 40 miles S. of Bristol and 123 WSW. of London, is built of red brick and yellow stone, on a hillside sloping to the Yeo. St John's Church, 'the Lantern of the West,' is a fine Perpendicular structure of the 15th century, restored in 1864. A Grecian town-hall was built in 1849. The woollen industry is extinct, but gloves are manufactured, and the place is an important agricultural and dairying centre. Pop. (1901) 9838; (1911) 13,759; (1921) 14,987.

Yerba Maté. See MATÉ.

Yerkes Observatory, in connection with the university of Chicago, is situated at Lake Geneva, Wisconsin, about 65 miles NW. of Chicago. Endowed in 1892 by Charles Tyson Yerkes (1837–1905), railway financier, it was completed in 1896; and it contains a 40-inch refracting telescope, the largest in existence.

Yermak, TIMOFEËFF, a Russian fugitive criminal who in 1580 led a body of Don Cossacks to the conquest of Siberia (q.v.). He was drowned crossing the Irtish in 1584.

Yesso. See YEZO.

Yetholm, a Border village of Roxburghshire, at the foot of the Cheviots, 7½ miles SE. of Kelso. Bowmont Water divides it into Town-Yetholm and Kirk-Yetholm, the latter the headquarters of the Scottish Gypsies, who seem to have settled here as early at least as the 17th century.

Yew (*Taxus*), a genus of Taxaceæ (a subdivision of Coniferæ), characterised by solitary and terminal fertile flowers, with a solitary ovule sessile in the centre of a fleshy disk, forming a sort of berry when in fruit. The species are diffused over the whole northern parts of the world, and are large and beautiful evergreen trees, with narrow lanceolate or linear leaves. The Common Yew (*T. baccata*), a tree of 30 to 40 feet, and a trunk sometimes of great thickness, branching a few feet above the ground, and forming a large and dense head, is a native of the middle and south of Europe and of Siberia. Noble specimens of it are to be seen in many parts of Britain. It attains a great age, at least 300 or 400 years: for one in Darley Dale churchyard, Derbyshire, an age is claimed of 'as much as three thousand years,' this tree being 33 feet in girth; and an equal longevity is ascribed to the Fortingal Yew, near Aberfeldy, in Perthshire, which is now a mere wreck, but in Pennant's day (1772) girthed 56 feet. The wood has been much used from very early times for making bows, for which it is preferred to every other kind of wood. It is very hard, and reckoned almost equal to boxwood for fine work. Like the box, it occupies an important place in the old 'topiary' style of landscape gardening, being clipped into dragons, peacocks, and the like, and forming close, trim hedges. The heart-wood is of an orange-red or deep-brown colour. The fruit is red, and was long reputed poisonous, but the pulpy part is not so; the seed, however, is a dangerous poison. The leaves are a powerful narcotic, and are sometimes given as a vermifuge. The Irish Yew (*T. fastigiata* of Lindley; *T. hibernica* of Hooker) is by many supposed to be a mere form, or at best a variety, of

Branch of Yew (*Taxus baccata*).

the common yew, with upright fastigiate habit and scattered leaves, whilst those of the common yew are in two rows. The North American yew (*T. canadensis*) is of a humbler growth. The Canadian and Japanese Yews grow well in England. See *The Yew Trees of Great Britain and Ireland* by Dr J. Lowe (1897) and Dallimore's *Holly, Yew, and Box* (1908). A related genus is Acmopyle, represented by *A. Pancheri* in New Caledonia. The genus Torreya has a curious distribution. It has one species (*T. taxifolia*) in Florida, one (*T. californica*) in California, one (*T. Fargesii*) in SW. China, one (*T. nucifera*) in Japan and SE. China. What is to be found in European gardens as *T. grandis*, introduced by Fortune, is a variety of *T. nucifera*. Torreya is a dicœcious genus resembling yew in foliation, but the leaves are longer, rigid, and spine-tipped. The fruits look much like a plum or a nutmeg, hence the Californian species passes under the common name of 'Californian nutmeg' though the resemblance is in shape only. For other genera of Taxaceæ, see DACRYDIUM, PODOCARPUS.

Yezd, or YAZD, a city near the centre of Persia, on a comparatively small oasis, beyond which is salt and sandy desert bounded by mountains. It is on the route between Isfahân and Kerman, prepares sugar, henna, and opium for all Persia, and is famous for its felts and silk stuffs. The Musjid-i-Juma has two high dilapidated minarets. Most houses have underground apartments, ventilated by wind-towers, in which the inhabitants may take refuge in sandstorms. There are many Zoroastrians (see PARSEES) who are the chief merchants, and are cleanlier and healthier than the Moslems. Total pop. 35,000. See N. Malcolm, *Five Years in a Persian Town* (1905).

Yezdigerd, the name of three Persian kings of the Sassanid dynasty. The first (399–420) was a good ruler, tolerated the Christians and preserved peace with the Roman Empire, but was known to the Persians as 'the sinner' and was probably assassinated.—His grandson Yezdigerd II. (438–457) was

less peaceful, while the third king of the name who ascended the throne in 632 while yet a child was the last of the Sassanid kings. A fugitive from the Arab conquerors (see PERSIA, p. 35), he was assassinated in 651. From his accession the Parsees count the years of their calendar.

Yezîdis, called Devil-worshippers, are found in Caucasus, Armenia, and Kurdistan. They pay respect to the Fallen Angel, whom they regard as the creative agent of the Supreme God, forgiven since his fall from grace, and restored to his heavenly rank. Their faith shows traces of old Iranian beliefs, mixed with Zoroastrian, Manichæan, and Nestorian elements.

Yezo, or EZO, less correctly YESSO, the most northerly of the four great islands of Japan, is in size about equal to Ireland, and is still only partially settled. The official name of *Hokkaido*, or 'Circuit of the Northern Sea,' was given in 1870, when the capital was changed from Matsumae to Sapporo, which was provided with a railroad to Otam, its port, and to Poronai, the great coal district inland. The principal products of Yezo are coal, seaweed, sulphur, fish, the catches of salmon on the river Ishikari being sometimes enormous. The original inhabitants were probably pit-dwellers, of whom traces have been found in various places. After these came Ainos (q.v.) or Ainus, a population either stationary or decreasing; they are harmless, lazy, and drunken. The southern corner of the island was wrested from them in the 16th century, and the castle of Matsumae, in the extreme south-west, became in the next century the headquarters of Japanese rule. Yezo has a rigorous climate, being for six months of the year under snow and ice. The interior is mountainous and inhospitable; there are several active volcanoes.

Yggdrasil. See SCANDINAVIAN MYTHOLOGY. According to Vigfússon and Powell (*Corpus Poeticum Boreale*, 1883), Yggdrasil is not a primitive Scandinavian idea, but originated after the contact with Christianity, and was a corruption of the cross. In *Odin's Horse, Yggdrasil* (1895), Magnusson argued that it was originally the same as Sleipner, the steed of Odin.

Yguazú. See IGUASSÚ.

Yiddish. See HEBREW LANGUAGE, SLANG.

Ylang-ylang, an oil derived from *Cananga odorata*, a native of the Philippine Islands, owes its value for perfumery to linalol and geraniol.

Ymuiden, or IJMUIDEN, a fishing town at the North Sea end of the Amsterdam Ship Canal, has gigantic locks.

Yoga, a system of Hindu philosophy (See SANSKRIT, Vol. IX. p. 90). A Yogī or Jogī may be a follower of that system, but in popular acceptation and in origin the term denotes any Hindu ascetic or devotee.

Yogh, the old English letter ȝ. See G, Y, Z.

Yogurt, Bulgarian soured milk.

Yokohama, one of the chief ports of Japan, and the headquarters of foreign shipping companies, banks, consulates, and commerce generally, is situated on Tokyo Bay, about 18 m. S. by W. of the capital. Until the opening of the country in 1854 it was an insignificant fishing-village, contiguous to the important town of Kanagawa, originally granted as a treaty settlement. The obstructions offered by the Japanese and the impatience of foreign merchants led to the practical abandonment of Kanagawa, which, however, still remained nominally the seat of the various consulates. Yokohama, however, suffered enormous damage by the earthquake of 1st September 1923 (see TOKYO), which was followed here by a fire and an earthquake wave. About three-quarters of the town was utterly destroyed, including the business quarter in the flat levels and the residential quarter on the Bluff (a beautiful spot commanding fine views of Fuji-san and of Yokohama Bay). Some 23,400 people were killed, and 42,000 injured. The work of reconstruction, shared by the municipality and the state, was immediately begun; buildings of ferro-concrete, and bridges and canals were set up, and parks and widened streets were laid out. The abandonment of the city was even suggested, but the harbour, which covers now some 1300 acres, was too important an asset. There is a depth of 33 feet of water at high tide, and the largest ocean liners can be accommodated. There is a very active trade at Yokohama. The imports are principally cottons, woollens, metals, machinery. Silk makes up three-fourths of the exports. Pop. (1884) 70,019; (1899) 193,762; (1908) 394,303; (1925) 405,888.

Yokosuka, a great Japanese naval station, 13 miles SW. of Yokohama. Its vast arsenals, dockyard, and appliances for shipbuilding were all but totally destroyed by the earthquake of 1st September 1923; but reconstruction soon began. Pop. (1890) 25,000; (1925) 96,351.

Yola, once capital of Adamawa (q.v.), but now capital of a province in northern Nigeria, is on the Benue, 250 miles SSW. of Lake Chad; a widely scattered town with a pop. of 20,000.

Yong, BARTHOLOMEW (?1560–?1612 or 1621), translator, son of a London grocer, travelled in Spain during his youth—probably on business for an imprisoned recusant uncle—and, returning in 1580, spent 'welny three yeeres in some serious studies' which gained him admission to the Middle Temple. In 1582 he undertook the translation of the *Diana* of Montemayor (q.v.) and others, and in 1586 translated the fourth book of Guazzo's *Civil Conversazione* and in 1587 Boccaccio's *Fiammetta*. His translation of the *Diana*, a work which is held to have influenced Sidney and Shakespeare, was not published till 1598. See T. P. Harrison in *The Modern Language Review* (April 1926).

Yonge, CHARLOTTE MARY, a popular novelist, and an author of considerable range and versatility, the only daughter of W. C. Yonge, of Otterbourne, Hants, was born in 1823. She gained a large constituency of readers by her *Heir of Redclyffe* (1853) and its successors, and her industry may be judged from the fact that within forty-four years (1848–92) she had published at least 112 volumes, or almost three annually, besides works translated and edited, and the editorship of the *Monthly Packet*. Her novels are natural, show dramatic skill and literary grace, and inculcate a healthy morality; many of them are made the vehicle of High Church opinions; for though she was bred in an evangelical household, the teaching of the Tractarians and her close personal friendship with Keble were the most outstanding influences in the formation of her life and thought. Singular to relate (as it seems to us now), William Morris, Burne Jones, and their group at Oxford adopted the hero of the *Heir of Redclyffe* as their model. The profits from that very popular story were largely devoted to fitting out a missionary schooner for Bishop Selwyn; and the profits of the *Daisy Chain* to building a missionary college in New Zealand. Miss Yonge, who died 24th March 1901, published several historical works (including eight volumes of *Cameos from English History*), books on military commanders, good women, and golden deeds, a work on *Christian Names* (1863), a *Life of Bishop Patteson* (1873), and a monograph on *Hannah More* (1888). See her Life by Miss Christabel Coleridge (1903).

Yoni. See LINGA.

Yonkers, a city of New York State, practically a north-eastern suburb of the city of New York, on the Hudson River, opposite the Palisades; pop. (1880) 18,892; (1900) 47,931; (1920) 100,176.

Yonne, a department in the north-east of France surrounded by the departments of Seine-et-Marne, Aube, Côte-d'Or, Nièvre, and Loiret. Area, 2868 sq. m.; pop. (1886) 355,364; (1921) 271,118; (1926) 277,230. The department is watered by the river Yonne, which flows NE. across it. Many of the hills are covered with fruitful vineyards, the intervening valleys are beautiful and fertile, and there are fine forests. The vineyards yield large quantities of wine, the best being those of Chablis, Auxerre, and Tonnerre. The capital is Auxerre.

York, a city of Yorkshire, not included in any of the three ridings but forming a county of itself, is situated at the confluence of the river Foss with the Ouse, 188 miles N. of London by rail. It is the seat of an archbishopric, has a lord mayor, and returns one member to parliament. The population of the municipal borough in 1881 was 61,789. It was made a county borough in 1888, and in 1893 the boundaries were extended; pop. (1921) 84,052. York was known as Eboracum under the Romans, of whom many relics still remain, chief among them being the building known as the multangular tower. The numerous sepulchral monuments,

York Minster.

pavements, and other relics now preserved in the museum were mainly found in the extensive Roman cemetery discovered in digging the foundations of the railway station. From the time of Henry II. for five hundred years parliaments occasionally sat at York, as the name of Parliament Street still bears witness, while under Henry III. the courts of King's Bench and Exchequer were held here.

The Minster is among the most magnificent of English cathedrals, and is of especial architectural interest owing to the fact of the fabric-rolls having been preserved, so that we know the precise dates at which the various portions were erected. Early in the 7th century Edwin, the first Christian king of Northumbria, founded, on the site of the present Minster, a church which perished by fire in 741. The church was rebuilt, but, during the conflagration of the city at the time of the Norman invasion, was again destroyed, with the exception of the central wall of the existing crypt, which also contains portions of the Norman church erected by Archbishop Roger (1154–81). Early in the following century the beautiful Early English transepts were added by Archbishop Gray. The present nave was built between 1291 and 1345; the graceful Decorated Chapter-house (q.v.) between 1300 and 1330; and the Norman choir was replaced by a Perpendicular one, 1373–1400. The central lantern tower belongs to the beginning of the 15th century, and the two western towers were added between 1430 and 1470. In 1829 the roof and carved choir-stalls perished in an incendiary fire, and in 1840 another fire destroyed the roof of the nave and the splendid peal of bells, reducing the south-western tower to a mere shell. Especially worthy of notice is the Decorated stained glass, the great east window being almost unrivalled. The extreme length of the Minster is 524 feet, of the transepts 250, and the breadth of the nave is 140 feet, the height of the central tower is 216, and of the western ones 201 feet.

The Benedictine Abbey of St Mary possessed great wealth and importance. It was founded in the reign of Rufus, but was largely rebuilt towards the end of the 13th century. In 1132 a small body of the monks, wishing to adopt the stricter Cistercian rule, seceded in spite of violent opposition, and finally founded the great Abbey of Fountains (q.v.). The existing ruins are principally those of the beautiful abbey church, while the old Guest-house has now been appropriated as a storehouse for Roman and other antiquities. At the Reformation York contained forty-one parish churches, of which twenty-two now remain, several new ones having been added. There is a fine Roman Catholic pro-cathedral (1864). The present walls, 2¾ miles in circuit, are mainly of the time of Edward III., though in many parts they follow the line of the Roman earthwork. They are pierced by picturesque gates, locally called Bars, of which Bootham Bar and Micklegate Bar are especially well preserved. The castle, with its picturesque Clifford's Tower, is situated close to the river, and is believed to date from the time of Edward I., though older portions may be included in the structure, which suffered severely during the siege of 1644. The Assize Courts are now held in a portion of the building. The fine Gothic structure of the Guildhall belongs to the 15th century.

Among endowed schools are St Peter's School, founded in 1557; Archbishop Holgate's Free School, dating from the time of Henry VIII.; the Blue-coat School for boys, the Grey-coat for girls, and the Yorkshire School for the Blind. Other institutions are the County Hospital, the Dispensary, and the Lunatic Asylum. York is an important railway centre, and its station (1873–77) is one of the largest in England. There are manufactories of confectionery, cocoa, glass, and chemical manures. The British Association was

organised at York in 1831. For other events in the history of the city, see YORKSHIRE.

York, the capital of York county, Pennsylvania, on Codorus Creek, 22 miles SSE. of Harrisburg. It has a large granite court-house, a handsome collegiate institute, numerous churches, and a great variety of manufactures. York, which is a pleasant town, dates from 1741, and was the seat of the Continental congress for a time in 1777. Pop. (1880) 13,940; (1900) 33,708; (1920) 47,512.

York, a river of Virginia, formed by the union of the Pamunkey and Mattapony, flowing south-east to Chesapeake Bay, nearly opposite Cape Charles. It is 40 miles long, and from 1 to 3 miles wide.

York, THE DUKEDOM OF, has been frequently conferred by the king of England on his second son. Edward III. bestowed it on his fourth son Edmund, who founded that House of York which formed the one side during the Wars of the Roses (see ROSES, WARWICK), and which in the persons of Edward IV., Edward V., and Richard III. occupied the throne of England. Henry VIII. and Charles I. were dukes of York while their elder brothers were alive; James II. till his accession. The Old Pretender conferred the dignity on his son, afterwards Cardinal York (see STEWART). George I. honoured with this title his brother Ernest Augustus, prince-bishop of the secularised see of Osnabrück (d. 1728); and in 1760 the rank fell to Edward Augustus (1739–67), George III.'s brother. George III. gave it to his second son, Frederick Augustus, prince-bishop of Osnabrück (1763–1827), who showed his military incapacity in command of an expedition to the Netherlands against the French in 1793, and again in 1799, having in 1795 been made commander-in-chief of the British army. He had to resign that post because of the shameful traffic in military appointments carried on by his mistress, Mrs Clarke, but was reinstated (1811). The title was next in abeyance till May 1892, when the dukedom was conferred on Prince George Frederick Ernest Albert, second son of the Prince of Wales (see GEORGE V.). In 1920 it was conferred on his second son, Prince Albert Frederick Arthur George (born 1895). See G. Brooks, *The Dukes of York* (1927).

York, CARDINAL. See STEWART.

Yorke, PHILIP, EARL OF HARDWICKE (1690–1764), rose through all the legal dignities till in 1737 he became Lord Chancellor. He supported Walpole, and held office under the Duke of Newcastle. His name is associated with the Marriage Act of 1754 which put an end to Fleet marriages (see FLEET PRISON). See his *Life and Correspondence* by P. C. Yorke (1913).

Yorkshire is by far the largest of the English geographical counties. It is bounded on the E. by the sea, separated on the N. by the river Tees from the county palatine of Durham, divided from Westmorland and Lancashire mainly by the water-parting of the Pennine chain on the W., and bounded on the S. by Derbyshire and Notts, while the Humber separates it from Lincolnshire. The western boundaries of the county were not fixed till the erection of the Earldom of Lancaster in the reign of Henry III., in Domesday Book the northern part of Lancashire and portions of Westmorland and Cumberland being included in the West Riding. For administrative purposes Yorkshire is divided into three Ridings (*thridings*, or 'thirds'), each of which has its own lord-lieutenant, magistracy, and constabulary, and is an administrative county. There are eleven wapentakes in the North Riding, nine in the West Riding, and six in the East Riding. The wapentake of the Ainsty, or county of the city of York, is a 'peculiar,' under a jurisdiction of its own, that of the lord mayor and aldermen of York; and is not included in any of the three Ridings. Sundry subdivisions of the county go by the name of shires, as Hallamshire, Richmondshire, Allertonshire, Howdenshire, Cravenshire or Craven, Holderness, and Cleveland. Besides the city of York, Yorkshire contains the county boroughs of Hull (in the East Riding), Middlesbrough (in the North), Barnsley, Bradford, Dewsbury, Halifax, Huddersfield, Leeds, Rotherham, Sheffield, and Wakefield (in the West). York, Hull, Bradford, Leeds, Sheffield, and Wakefield, as well as Ripon, are designated cities. The total area is 3,889,432 statute acres, or nearly 6112 sq. m., all, with the exception of the catchment basins of the Esk and parts of those of the Tees and Ribble, being drained by the Ouse and its great tributaries, the Swale, the Ure, the Nidd, the Wharfe, the Aire, the Don, and the Derwent. Since 1918 the county divisions have returned twenty-six members, and the cities and boroughs thirty-one. Pop. (1801) 859,133; (1841) 1,592,059; (1881) 2,886,564; (1921) 4,182,735. The East Riding (county town Beverley) had 750,115 acres and 460,717 inhabitants; the North (Northallerton) 1,362,058 and 456,312; the West (Wakefield) 1,773,529 and 3,181,654; the city of York 3730 and 84,052. County boroughs are included.

In Yorkshire the older rocks lie mainly to the north-west, and the newer to the south-east. On the extreme western border of the county are found the most ancient strata—viz. the slates and flags of Hougill Fells and Ingleton. These are overlaid by the Mountain Limestone and the Millstone Grits of the Pennine chain, which are intersected by the magnificent dislocation of the great 'Craven fault' to which is due some of the most striking scenery in Yorkshire. The lift varies between 300 and 3000 feet, causing the precipitous cliffs of Gordale, Malham, Settle, and Ingleborough, which are honeycombed by extensive caves. The Pennine chain rises to its highest point in Mickle Fell, 2581 feet, while Ingleborough and Whernside touch respectively 2361 and 2384 feet. On the eastern side of the chain are the famous 'Yorkshire dales,' Wensleydale, Wharfedale, Swaledale, and others, in many of which are picturesque waterfalls, or forces, as they are locally called—such as Caldron Snout and High Force in Teesdale, Aysgarth Force and Hardraw Force on the Ure, where the rapid mountain-streams leap over ledges formed by the harder strata of the Mountain Limestone. The Yorkshire Coal Measures, on which are situated the manufacturing towns of Leeds, Bradford, Sheffield, Rotherham, Huddersfield, and Halifax, are confined to the southern portion of the county, and are continuous with the coalfields of Derbyshire and Notts. In the North Riding we have a great development of the Lias, in which are imbedded the ammonites well-known to visitors at Whitby; while the Cleveland moors, which rise to heights of 1400 feet, are dissected by a great dyke running from west to east, which is extensively quarried at various points for road-metal. The prosperity of Middlesbrough is due to the celebrated hæmatite iron ores of Cleveland, which have been extensively worked of late years. In the East Riding the Oolitic beds are overlaid by the Kimmeridge Clay and by the Chalk, which forms the high tableland of the Wolds, while the greater part of Holderness is covered by a thick superficial stratum of glacial drift and alluvium. The rich level tract of the Vale of York also consists of glacial and alluvial

deposits, thickly overlying and concealing the New Red Sandstone.

The sepulchral barrows on the Wolds, and the caves of Craven and Kirkdale have yielded results of the highest importance, forming the basis of our knowledge of the prehistoric animals and races of Yorkshire. There are gigantic monoliths near Boroughbridge. At the time of the Roman conquest the country was inhabited by the Celtic tribe of the Brigantes, whose capital was at Aldborough (*Isurium*). The country was invaded by the Romans about 50 A.D., more than a century after Cæsar's landing in Kent, the conquest being completed in the reign of Vespasian, by Agricola, *c.* 79 A.D. York (*Eboracum*) is first mentioned as being the headquarters of the Sixth Legion, which came into Britain with Hadrian, and for 300 years remained stationed at York, which became the chief city of Northern Britain, the surrounding country being studded with camps and covered with a network of Roman roads. Several of the emperors visited York, and here in 211 died Severus, and in 306 Constantius Chlorus. And from York his son Constantine the Great, having been proclaimed by the soldiery, set forth to assume the purple. In 410, in consequence of the Vandal invasion of Gaul, the legions were withdrawn by Honorius, and for 150 years utter darkness closes in, and envelops the overthrow of the Brito-Roman civilisation, and the establishment of the Teutonic kingdoms. The earthen ramparts, thrown up to hinder the march of the invaders, may still be traced. In 500 A.D. St Samson of Dol, we are told, was driven from his bishopric of York, and in the middle of the 6th century (547) we find that the heathen Angles had established their rule, although the little British kingdoms of Leeds (*Loidis*) and Elmet held out till 616, when they were conquered by King Edwin of Northumbria, the Yorkshire portion of whose realm was known as Deira. Edwin, who had been baptised by Paulinus on Easter Day, 627, was defeated and slain at Hatfield Chase near Doncaster in 633, by Penda, the heathen king of Mercia. Toward the end of the 8th century the Northmen began to appear in the Humber, ravaging and finally settling in the country; while York became the capital of a Danish kingdom.

In 1066, three weeks before the battle of Hastings, Harold and Earl Morkere issued from York to vanquish the Norwegian army at Stamford Bridge. It was not until 1068 that William marched into Northumbria, and on the suppression of the final struggle for independence in the following year a broad belt of country underwent that ruthless devastation of which we find notable traces in Domesday Book. Henceforth Yorkshire is known by its modern name.

At the battle of the Standard, fought near Northallerton, David, king of Scotland, was repulsed in 1138 by the northern barons. During the Wars of the Roses, Richard, Duke of York, was defeated by Queen Margaret and slain at the battle of Wakefield, in 1460; and in the next year Edward IV. won the bloody victory of Towton over Henry VI. The year 1536 is signalised by the rebellion in defence of the old faith, known as the Pilgrimage of Grace; York, Pontefract, and Hull being captured by the insurgents. In 1569 Yorkshire was the scene of another rising on behalf of Mary, Queen of Scots. During the Civil War the county was mainly royalist. Bradford, Hull, Pontefract, and Scarborough were besieged, and the attempt of the royalists to raise the siege of York was frustrated by their crushing defeat at Marston Moor (2d July 1644).

No part of England is richer in the remains of monastic houses, of which there were at the dissolution fifty-three abbeys and priories and twenty-eight friaries. The beautiful buildings of Rievaulx, Jervaulx, Fountains, Kirkstall, and Bylands are unequalled among the Cistercian houses not only of England, but of Europe. The three great Benedictine houses were Whitby, Selby, and St Mary's, York, the two latter being ruled over by mitred abbots. The magnificent pile which goes by the name of Beverley Minster was the church of a college of secular canons, as also were York Minster and Ripon Cathedral. Newburgh, Nostel, Bridlington, Guisborough, Bolton, and Kirkham were all Augustinian priories. The Priory of Mount Grace was Carthusian, Easby Abbey was Premonstratensian, and Malton Priory Gilbertine. Lastingham, where there is an ancient Saxon crypt, possesses great interest as being the seat of the early Irish Christianity introduced into Yorkshire by St Chad; while in the ancient crosses and inscriptions at Kirkdale church we have some of the oldest ecclesiastical remains in England.

Among the Yorkshire castles may be named those of Knaresborough and Pontefract, the old and interesting ruin of Conisborough, Richmond, with its fine Norman keep, Middleham, the residence of Warwick the king-maker, and Bolton, the prison of Mary, Queen of Scots. Wressle Castle was once the seat of the Percies, and Gilling, which is still used as a residence, of the Fairfaxes.

Since the beginning of the 19th century the manufactures of Yorkshire have enormously developed. Leeds and Bradford are the centres of the woollen and worsted trades, while the cutlery of Sheffield is unrivalled. Of the numerous smelting and puddling furnaces the chief are those at Rotherham and Middlesbrough. The agricultural portions of the county are well served by railways, while the manufacturing districts are covered with a network of lines; the chief towns being also connected by a system of canals, extending from sea to sea, and piercing the Pennine chain at a height of 656 feet above the sea by a tunnel three miles in length. Beyond the mining and manufacturing districts the population is agricultural, one of the principal industries being horse-breeding, for which Yorkshire is famous. Among the inland health-resorts Harrogate and Ilkley rank first, while the coast southward from Redcar and Saltburn is fringed with small watering-places, in addition to the larger towns of Whitby, Scarborough, Filey, Bridlington, Withernsea, and Hornsea.

See 'The Victoria History' (1907 *et seq.*). Certain districts have been well treated, Poulson's *Holderness* and Hunter's *Hallamshire and South Yorkshire* deserving special commendation; Drake's *Eboracum*, Ormsby's *Diocesan History*, Lawton's *Collections*, Dixon's *Fasti Eboracences*, and Kendal and Wroot's *Geology of Yorkshire* may be consulted, together with many less important works enumerated in Anderson's *English Topography*. See J. E. Morris's volumes in the 'Little Guides' series; B. Hobson's *East Riding* (1924); J. S. Fletcher's *Making of Modern Yorkshire* (1918); Rev. C. F. Morris, *Yorkshire Folk-talk* (1911); various collections of dialect poems and plays ed. F. W. Moorman; Cowling's *Dialect of Hackness*, &c.

Yorktown, capital of York county, Virginia, on the York River, 10 miles from its mouth. Pop. 150. Here Lord Cornwallis surrendered to Washington in 1781; and here the Confederates, who had fortified the place, were besieged in 1862 by McClellan, and compelled to evacuate it.

York von Wartenburg, Hans David Ludwig (1759–1830), Prussian field-marshal and count, was the son of a Pomeranian, Captain von York (or Jarck), descended, according to the family tradition, from an English family that had settled during the Stewart troubles first in Sweden and then in Pomerania. Young York entered the army

in 1772, was cashiered for insubordination, and served the Dutch in the East Indies, but returning to the Prussian service gained glory in the wars of 1794 and 1806. He was especially distinguished during the war of liberation and the invasion of France (1813–14). He was made a count in 1814, and a field-marshal in 1821.

Yoruba, or YARIBA, once a West African kingdom east of Dahomey, extending from Borgu nearly to the Bight of Benin, now included in Nigeria (q.v.). The inhabitants, some 2,000,000, are Negroes partly Mohammedanised. See Ellis, *The Yoruba-speaking Peoples* (1894), and a history by S. Johnson (1921).

Yosem'ité Valley is a cleft in the west slope of the Sierra Nevada, about the centre of California, and 140 miles E. of San Francisco. The name Yosemite is an Indian word which signifies 'large grizzly bear.' This celebrated valley, noted for the sublimity and beauty of its scenery, is about 6 miles long and from ½ to nearly 2 miles in breadth, and is traversed by the Merced River. The visitor is awed and impressed by the massiveness of its mountain elevations, the nearly perpendicular granite walls, from 3000 to 6000 feet high, by which it is shut in throughout its entire length, and the grandeur of its waterfalls, which are in some respects the most remarkable in the world. At the lower end of the valley stands the striking cliff known as El Capitan, 3300 feet high, while from near its lower corner the Virgin's Tears Fall descends 1000 feet. But the eye turns from it to the remarkable fall opposite, happily named the Bridal Veil, which leaps from the brow of a cliff 900 feet high, and descends in a broad sheet of spray and finally mist, swaying in the wind and constantly changing its form of fleecy beauty. Farther up the valley are Cathedral Rock (2660 feet), the Three Brothers (3830), Sentinel Rock (3043), and directly opposite it the grand Yosemite Falls; here the stream, 25 feet wide at the crest, takes a first leap of 1500 feet, then rushes 626 feet down in a series of cascades, and finally plunges 400 feet to the bottom. Above the falls are the North Dome (3568) and the vast Half Dome, nearly a mile (4737) high, whose summit can now be reached by a long climb. Two miles above the great falls the stream enters the main valley in two arms, coming out of two cañons. In that of the south fork is the Illilouet Fall, some 600 feet high; in the main cañon are Vernal Fall (400) and Nevada Fall (600), the latter one of the finest in the world. It is only, however, during the season of rains and melting snows that the valley can be seen at its best; in August and September the Virgin's Tears Fall disappears, the Bridal Veil shrinks almost to nothing, and even the Yosemite is reduced to comparative insignificance. The valley was discovered in 1851 by soldiers who pursued some predatory Indians to their fastness here; its fame quickly spread, and congress wisely took steps to preserve its beauties, and in 1864 handed it over to the state, along with the Mariposa grove of big trees (see SEQUOIA), to be held as inalienable for all time 'for public use, resort and recreation.' The State Park, consisting of the valley itself and a territory of two miles round it on all sides, is managed by a governor and state commissioners. The State Park is enclosed by the Yosemite National Park (1890; area 1125 sq. m.), which includes the basin of the river and all its tributaries. There is a handbook by A. F. Hall (1921).

Youghal (pron. nearly *Yawl*), a seaport of County Cork, on the estuary of the Blackwater, 27 miles E. of Cork by rail. The town has some structures of interest—the parish church, which is formed of the nave and aisles of the ancient collegiate church, built by the Earl of Desmond in 1464; the 'water-gate' and the 'clock-gate'; and Sir Walter Raleigh's house, Myrtle Grove, which remains nearly in its original state. There is a handsome Roman Catholic church, and remains of several ancient conventual and other buildings. Parts of the old walls are standing. In addition to the export of agricultural produce, bricks are made and sprats cured; salmon-fishing and the manufacture of point lace are also important. According to local tradition, the potato was first planted at Youghal by Raleigh, who was mayor in 1588. Till 1885 it sent a member to parliament. Pop. (1851) 7410; (1911) 5648; (1926) 5340.

Young, ARTHUR, writer on agriculture, was born on 11th September 1741 at Whitehall, but passed his boyhood, as indeed most of his life, at Bradfield Hall, near Bury St Edmunds, his father, Dr Young, being rector of Bradfield Combust and a prebendary of Canterbury. On quitting Lavenham grammar-school he was apprenticed in 1758 to a mercantile house at Lynn; but this 'most detestable situation' he left next year, upon his father's death, 'without education, pursuit, profession, or employment.' In 1763 he rented a small farm of his mother's, on which he made 3000 unsuccessful experiments; in 1765 married, not too happily, a sister of Fanny Burney's stepmother; during 1766–71 held a good-sized farm in Essex (ruin the result); from 1776 to 1778 was in Ireland; resumed farming at Bradfield; and in 1793 was appointed secretary to the newly-established Board of Agriculture, with a salary of £400. Blind from 1811, he died in London on 20th April 1820, and was buried at Bradfield. Arthur Young, by his writings, was one of the first to elevate agriculture to the dignity of a science, and render it popular among the upper classes of the country. Those writings, more than a score in number, include *A Six Weeks' Tour through the Southern Counties* (1768), *A Six Months' Tour through the North of England* (4 vols. 1771), *The Farmer's Tour through the East of England* (4 vols. 1770–71), *Tour in Ireland* (1780), *Travels in France during 1787–88–89–90* (2 vols. 1792–94), *The Farmers Calendar* (1771), which ran to many editions; and 'Agricultural Surveys' of eight English counties, besides many papers in *The Annals of Agriculture*, which he edited, and to which George III. ('Farmer George') was a contributor. His works were as successful as his practice was unsuccessful.

The Travels in France is a valuable first-hand authority for the state of France in the revolution period; see the edition, with Life, by Miss Betham-Edwards (1890); editions of the *Tour in Ireland* by Hutton (1892) and Constantia Maxwell (1925); Young's *Autobiography*, edited by Miss Betham-Edwards (1898); and Leslie Stephen's *Studies of a Biographer* (1898).

Young, BRIGHAM, American Mormon leader, was born at Whitingham, Vermont, June 1, 1801, and was the son of a small farmer proprietor. He received eleven days' schooling, and then was successively employed as carpenter, painter, and glazier in Mendon, New York. He first saw the 'Book of Mormon' in 1830, and in 1832, having become converted by Samuel H. Smith, a brother of the 'prophet,' he was baptised and began to preach near Mendon. Next he went to Kirtland, Ohio, was made an elder, and preached in Canada, 1832–33. In 1835 he was appointed one of the twelve apostles of the Church, in 1844 president; and the Mormons, when driven from Nauvoo, were after various wanderings led by him to Utah in 1847. In 1840 he had visited England, and as a result there were 2000 proselytes that year. In 1848 the great body of Mormons arrived

in Utah, and founded Salt Lake City; and in 1851 Fillmore, president of the United States, appointed Brigham Young governor (1851–58). In 1858 a new governor, Cumming, was appointed, and sent with a force of 2500 United States troops to protect him and the Federal officers; a compromise was effected, and the troops remained until 1860. The determination of the United States to abolish polygamy, and the appointment, in 1869, of a new United States governor, contributed somewhat to reduce Young's authority. In 1874 his fifteenth wife petitioned the United States courts for a divorce, and separated from him. Young encouraged agriculture and manufactures, made roads and bridges, carried through a contract for 100 miles of the Union Pacific Railroad, and was otherwise a friend to commercial progress. Practical and far-seeing, he had the faculty of accumulating wealth, although on one side of his character he appeared to be a fanatical enthusiast. Young died August 29, 1877, leaving a fortune of 2,500,000 dollars to seventeen wives and fifty-six children. See a study by M. R. Werner (1925); and the articles MORMONS, SALT LAKE CITY, and UTAH.

Young, CHARLES MAYNE, tragedian, was born on 10th January 1777, the second son of a clever but scoundrelly London surgeon. He spent a twelvemonth with an uncle at the Danish court (1786–87), was educated at Eton and Merchant Taylors, and, driven from home with his mother and two brothers, had for a while been a clerk in a West India house, when, in 1798 he made his début at Liverpool. One hiss—his father's—was mingled with the applause that greeted his first appearance in London, in 1807, as 'Hamlet'; this, 'Iago,' and 'Falstaff' being perhaps his best characters. 'With his personal advantages and his damned musical voice,' as Kean put it, he was a really original actor, second only, nay in some parts superior, to Kean himself. In 1832 he retired with a fortune of £60,000. He died at Southwick, near Brighton, on 28th June 1856. In 1805 he had married a brilliant young actress, Julia Anne Grimani (1785–1806); she left him a son, the Rev. Julian Charles Young (1806–73), who published a most amusing *Memoir of Charles Mayne Young* (2 vols. 1871), four-fifths of which is taken up with his own (Julian Charles's) Journal, supplemented in 1875 by *Last Leaves* from that same Journal.

Young, EDWARD, author of the *Night Thoughts*, was born at Upham rectory, Hampshire, in June 1683. Later his father rose to be dean of Salisbury and chaplain to William and Mary. He was educated at Winchester, entered New College, Oxford, in 1702, the following year migrated to Corpus Christi College, and in 1708 received a law fellowship in All Souls College from Archbishop Tenison. Here he seems not to have been righteous overmuch, to have passed, in Pope's words, 'a foolish youth, the sport of peers and poets.' Yet we are told he used to stand up to Tindal and more than hold his own in the struggle. He came before the world as a poet in 1713 with an *Epistle* to George Granville on being created Lord Lansdowne —a characteristic beginning for Young, who continued through life one of the most persevering and shameless toadies that ever flattered a patron or a king's mistress. His *Last Day* and *Force of Religion, or Vanquished Love*, followed in 1713 and 1714; the poem on the *Death of Queen Anne* was written also, with one eye on her successor, in 1714. In 1719 he ventured on the more ambitious effort of a tragedy, which, under the title of *Busiris*, was brought out at Drury Lane. Its inflated style was cleverly made fun of by Fielding in his burlesque *Tom Thumb* (1730). In the autumn of 1717 Young seems to have been in Ireland in attendance on the hare-brained and dissolute young Marquis of Wharton (made duke in 1718). For some time also he resided in the family of the Marquis of Exeter as private tutor to Lord Burghley. But about 1719 we find him again in the train of Wharton, who gave him in 1721 a bond for £600 in consideration of his expenses in travelling and his losses in unsuccessfully contesting Cirencester. The duke seems to have entertained for him a real kindness, but the pious author of the *Night Thoughts* must have bowed low and often in the House of Rimmon to have retained it, as well as to have been a friend of that wretched reprobate Bubb Dodington, at whose seat at Eastbury in Dorsetshire he saw much of Voltaire in 1722. At Wharton's death in 1731 Young set forth certain claims against his estates, which he succeeded in making good to the extent of an annuity of £200. In 1721 was produced his tragedy *The Revenge*, which, though unsuccessful at the time, was still acted in the 19th century. The dedication to Wharton is a disgusting piece of flattery. His third and last attempt in this field, *The Brothers*, was written by 1726, but its production was delayed till 1753. Between 1725 and 1728 appeared in succession his satires, under the title of *Love of Fame, the Universal Passion.* These had a great success, and brought to their fortunate author money as well as fame. Spence says Wharton alone gave him £2000. These satires show wit and talent, and even yet will repay perusal. For *The Instalment* (1726), a poem addressed to Sir Robert Walpole on his being made a Knight of the Garter, he was rewarded with a pension of £200. In 1727 Young took holy orders, and was appointed one of the royal chaplains; and in 1730 he became, by favour of his college, rector of Welwyn in Hertfordshire, a living worth £300 a year. The year after he married Lady Elizabeth Lee, the daughter of the Earl of Lichfield, and widow of Colonel Lee. He may be taken to have been happy with her, for out of his grief at her death (1741), together with that of her daughter and her daughter's husband, grew the *Night Thoughts* (1742–45), which, in spite of much fustian sublimity and artificial melancholy, bear the stamp of genuineness. He never received any further preferment in spite of his frequent complaints of being neglected, and he had not the honour to be the original of Parson Adams. His only son, Frederick Young, disliked the influence of his father's housekeeper, and for some years saw little of him. Young superintended in 1762 a collected edition of his works in 4 vols., from which he excluded certain of the most fulsome of his dedications. He died 5th April 1765.

Young's *Night Thoughts* long retained some popularity, and many of its sententious lines have passed into common and almost proverbial use. Many passages show point and force, soaring sometimes into the region of real poetry; many more, however, degenerate into flat verbiage, or sink into profound and hopeless bathos. His besetting mannerism is antithesis and grandiloquence, a pair which hang but indifferently together. But indeed fatal faults throughout all his work are the lack of genuine human sympathy, and a constant and radical insincerity as a poetic artist.

See the edition, with a poor Life, by Dr Doran (2 vols. 1854); the life in Johnson's *Lives of the Poets*, written by Herbert Croft, junior, in October 1782; the *Life and Letters*, by H. C. Shelley (1914). Young's *Conjectures on Original Composition* (1759; a letter to Samuel Richardson) was edited by Professor Edith Morley in 1918. For a severe attack on Young's character, see George Eliot's *Essays and Leaves from a Notebook* (1884). There is a German work on Young by Bernstorff (1895), and an admirable French study by Thomas (1901).

Young, JAMES, of paraffin fame, was born in Glasgow, 14th July 1811. The son of a joiner and cabinet-maker, he learned his father's trade, but attended classes, especially in chemistry, at the Andersonian College and the Mechanics' Institution in the evening. He became assistant in Glasgow to Professor Graham in 1832, and in 1837 obtained a post in University College, London. As manager of chemical works near Liverpool (1839) and near Manchester (1843) he discovered cheaper methods of producing stannate of soda and chlorate of potash; and it was his experiments made between 1847 and 1850 which led to the manufacture of paraffin-oil and solid paraffin on a large scale (see PARAFFIN). A friend of Dr Livingstone, he sent out an expedition to Africa to find him. He endowed a chair of Technical Chemistry in the Andersonian College, and was made LL.D. by Glasgow University. He died 13th May 1883.

Young, THOMAS, physicist, was born of Quaker parents at Milverton, Somersetshire, 13th June 1773, studied medicine at London, Edinburgh, Göttingen, and Cambridge, and started as doctor in London in 1800, but soon devoted himself to scientific research, and in 1801 became professor of Natural Philosopy to the Royal Institution. His *Course of Lectures* (1807) expounded the doctrine of Interference (q.v.), which established the undulatory theory of Light (q.v.). He was secretary to the Royal Society and to the Board of Longitudes, and did valuable work in insurance, hæmodynamics, and Egyptology (see HIEROGLYPHICS). He died 10th May 1829. See COLOUR-PERCEPTION; and Life by Peacock (1855).

Young England, the name applied, during the Corn-law struggle (1842–45), to a little band of young Tory politicians who wished to revive the old kindly relations between rich and poor, master and man. Among its members were Lord John Manners (7th Duke of Rutland from 1888; 1818–1906), Cochrane Baillie (Lord Lamington, 1816–90), the Hon. G. Smythe (Viscount Strangford, 1814–57), and Disraeli (Earl of Beaconsfield, 1804–81), whose novels *Coningsby* and *Sybil* (1844–45) are an exposition of their principles.

Young Ireland was the name given to the Revolutionary party in Ireland in 1848, comprising W. Smith O'Brien (q.v.) and Gavan Duffy (q.v.). See also O'CONNELL).

Young Men's Christian Associations were originally founded mainly for the spiritual and mental improvement of young men by means of devotional meetings, Bible classes, lectures, and libraries. There were young men's societies for missionary and other work previous to the founding of the London Y.M.C.A. in 1844, mainly through the exertions of Sir George Williams (1821–1905), of Hitchcock, Williams and Co., of St Paul's Churchyard. Twelve young men met on 6th June 1844, in a room in St Paul's Churchyard, and founded the 'Young Men's Christian Association' as a 'society for improving the spiritual condition of young men engaged in the drapery and other trades.' In 1845 a course of lectures was begun, which, when published as 'Exeter Hall Lectures,' filled 20 volumes (1845–65). The movement took firm root in London and in the provinces. At the general conference of delegates from the associations of Europe and America, held in Paris in August 1855, a basis of alliance was agreed upon; and later conferences further aided the movement. In America associations were formed at Montreal and Boston in 1851; 40 more were organised in the next three years; an international convention was held at Buffalo in 1854; and the organisation in North America has greatly outgrown the British branch. A cognate German association, adumbrated early in the 19th century, was more definitely organised in 1883; France had its system founded in 1855; the Swedish branch dates from 1883; the international committee began work in Japan in 1889. The Great War gave occasion for a vast expansion of the activities of Young Men's Christian Associations.—The Young Women's Christian Association, founded in Britain in 1857, in America in 1858, has kindred aims in seeking the moral, social, intellectual, and spiritual well-being of young women by means of evening classes, gymnasiums, reading-rooms, holiday homes, circulating libraries, provident and emigration and total abstinence departments, a Factory Helpers' Union, and Travellers' Aid Society for meeting girls at railway stations or at docks.—A Young Women's Hebrew Association with similar aims was founded in 1903, with headquarters at New York.

Youngstown, a manufacturing town of Ohio, on the Mahoning River, 60 miles SE. of Cleveland and 66 NW. of Pittsburgh, with important blast-furnaces, foundries, rolling-mills, manufactories of machinery, &c. Iron, coal, and limestone abound near by. Pop. (1880) 15,435; (1900) 44,885; (1920) 132,358.

Ypres (Flemish *Y'peren*), a Belgian town of West Flanders, on a fertile plain 30 miles SSW. of Bruges by rail, and 8 from the French frontier. Ypres was at one time one of the most important manufacturing towns in Flanders, the number of inhabitants in the 14th century being 200,000, and the number of looms 4000. Its staple manufacture was Diaper (q.v.). The only remnant of its once flourishing manufacture was the Cloth-hall (*Les Halles*), standing in the great market-place (*Grand' Place*), in a rich style of Gothic architecture 433 feet long, and surmounted till the World War by a stately square tower or belfry 230 feet high, with a clock and chimes. It was built 1230–1342, and restored in 1860; a part was added in 1730. The cathedral of St Martin was a fine Gothic edifice (1221–1350) with an altar of Carrara marble and a richly carved pulpit. Ypres is a very old town, its origin dating from the 9th and 10th centuries. In the great European wars it was frequently subject to sieges, while during the World War it figured very prominently. The ramparts, designed by Vauban, were much used by the British, while the town itself was all but utterly destroyed by German bombardment in 1914–15; but after the Armistice the work of restoration was rapidly taken in hand, chiefly by the state. The reconstruction of the Cloth Hall in the former style, and of the cathedral and other churches (all the buildings being in utter ruins), and the building of a Palais de Justice were begun. At the Menin Gate at the canal, a Triple Arch and Memorial Hall to the British soldiers were erected by 1927. In the Ypres salient there are 40 military cemeteries, mostly for the British, and numerous war memorials. Pop. 15,000. Jansen (q.v.) was Bishop of Ypres.

Ypres gave the name to three battles in the Great War. In the first battle the Germans occupied the town for three days in October 1914, and then bombarded it from the heights on the N., E., and S. The second battle, in the spring of 1915, was marked by the first discharge of poison gas by the Germans (22d April). The third battle, June to November 1917, was preluded by the capture of the Messines Ridge to the S. and finished by the storming of Passchendaele village to the NE. In all this fighting (which more or less continued throughout the whole war) the losses on both sides were enormous. In the spring of 1918 the British were driven back somewhat, but regained all the ridges by the autumn. Ypres was important as being on the route of the Germans to Calais. See Willson, *Ypres* (1920); also WORLD WAR.

Ypres, Sir John Denton Pinkstone French, Earl of (1852–1925), British general, was born at Ripple, Kent, of Irish extraction, entered the navy, but in 1874 obtained his commission in the hussars. He served in Egypt, and gained great distinction as a cavalry leader in the Boer War, reaching the rank of lieutenant-general. He then held the Aldershot command 1901–7, was appointed Inspector-General of the Forces in 1907, chief of the Imperial General Staff in 1911, and field-marshal in 1913. He commanded the British expeditionary forces in France till the end of 1915 (when he was raised to the peerage), and the home army 1916–18, and held the office of Lord-lieutenant of Ireland 1918–21, when he was given an earldom. Lord Ypres received the O.M. in 1914, and was made K.P. in 1917. A brilliant cavalry soldier, he found it difficult to adapt himself to the exigencies of trench warfare in France. See World War.

Ypsilanti, a Fanariot family, claiming to be descended from the imperial stock of the Comneni. Alexander (1725–1805), a dragoman at the Porte, was raised to be hospodar of Wallachia, but put to death on suspicion of stirring up Greek ambitions. —His son Constantine became also hospodar both of Moldavia and of Wallachia. Deposed in 1805, he came back with some thousands of Russian soldiers, stirred up the Serbians to rebellion, and made another plan for restoring Greece. But he had to flee to Russia, and died in Kieff in 1816.—His eldest son, Alexander (1783–1828), served with distinction in the Russian army in the campaigns of 1812 and 1813, and was chosen by the 'Hetairists,' a Greek secret society, as their chief in 1820. He headed a Ruman movement, but, defeated by the Turks, he was forced to take refuge in Austria. —His younger brother, Demetrius, who was born 25th December 1793, also commenced his career in the Russian army, and joined his brother in his schemes for emancipating the Christian population of Turkey. In Greece he took part in the capture of Tripolitza (October 1820). His gallant defence of Argos stopped the victorious march of the Turks, and he stubbornly resisted (1825) the victorious Ibrahim at Napoli. In 1828 the grateful Hellenes made him commander-in-chief of their forces. He resigned in 1830, and died at Vienna, 3d January 1832.

Ypsilanti, a city of Michigan, on the Huron River, 30 miles W. by S. of Detroit. It contains the state normal school, paper and other factories. Pop. 7400.

Yriarte, Charles, a French author of Spanish ancestry, was born in Paris on 5th December 1832. He studied architecture, but from 1861 devoted himself to literature; his works, over twenty in number, dealing with Spain, Paris, the Franco-German war, Venice (Eng. trans. 1879), Florence (Eng. trans. 1882), Cæsar Borgia (1889), Isabella d'Este (1892), &c.; and he contributed to *Chambers's Encyclopædia.* From 1894 he was inspector-general of fine art in France. He died 7th April 1898.

Ysaye, Eugène, Belgian violinist, conductor, and composer, was born at Liége in 1858, and early received instruction in music from his father, later studying with Vieuxtemps and Wieniawski. He has made many tours as solo violinist and leader of string quartett, has conducted in different countries, including the United States, and has directed for many years the *Concerts Ysaye* in Brussels. His playing is full of warmth and refinement. His brother Théophile (1865–1919) was a pianist and composer of merit.

Yser, a river of Belgium, about 50 miles long, rising in the dept. of Nord, France, and flowing into the North Sea near Nieuport. The Germans in their advance (October 1914) on Calais by the coast unsuccessfully attempted to break through the line of the Yser between Diksmuide (Dixmude) and Nieuport, which was eventually flooded by the Belgians.

Ysopet, or Isopet. See Fable, Marie de France.

Ystad, a port of Sweden on the Baltic, 36 miles ESE. of Malmö, with picturesque streets, and some mills and factories; pop. 12,000.

Ystradyfodwg. See Rhondda.

Yttrium (sym. Y; atom. number 39; atom. wt. 89), one of the rare metals, is contained in a few minerals, especially gadolinite, in which there are usually also present compounds of one or more other rare metals such as cerium, erbium, and lanthanum. Gadolinite, which is largely silicate of yttrium, contains from 36 to 46 per cent. of the oxide of yttrium. The metal yttrium has been obtained as a blackish-gray powder. The oxide yttria is a yellowish-white powder.—The name is derived from Ytter or Ytterby in Sweden; as is also Ytterbium for a time recognised as a metallic element, but in 1907–8 separated into two elements, Ytterbium or Neoytterbium (Yb; atom. number 70; atom. wt. 173·5) and Lutetium (Lu; 71; 175).

Yuan-chwang. See Hwen-thsang.

Yuan Shih-k'ai (1859–1916), Chinese statesman, held important administrative posts in Korea, Shantung (during the Boxer rising), Chihli, and was chief minister to the Dowager Empress during her last years. After her death in 1908 he lived in retirement till 1911, when he was called on to oppose the Cantonese extremists, and in March 1912 was elected first president of the Chinese Republic. A believer in autocratic central government, he attempted to make himself emperor in 1915, but failed largely through Japanese opposition.

Yucatán, a Central American peninsula dividing the Gulf of Mexico from the Caribbean Sea, and consisting of parts of Mexico, British Honduras, and Guatemala, mainly a low plateau. The interior is overspread with forests of mahogany, rosewood, and other valuable timber. Ruins consisting of temples and other vast edifices, richly carved and coloured, testify to an ancient civilisation. Made known to Europe in 1517, and completely conquered in 1541, this part of New Spain (granted in 1783 to English logwood-cutters for a time; see Despard) continued under Spanish domination till 1821. After repeated short periods of independence it has since 1852 belonged to Mexico, as a single state till 1858, as two states, Yucatán and Campeche (Campeachy) till 1902, when the territory of Quintana Roo was cut off. The state of Yucatán, the north part of the peninsula, has an area of 16,000 sq. m. and a population of 324,000, mostly of Maya Indian stock—the same who were in possession at the Spanish conquest. The rapid and abnormal development of henequen or sisal culture has led to what is hardly distinguishable from slavery for the Indian peons or labourers. This 'enforced service for debt' is represented to be atrociously cruel, killing off native Mayas and deported Yaquis in an incredibly short time. All the political power is in the hands of a few wealthy slave-holders. The capital is Mérida (q.v.). For Ancient Civilisation, see Mayas.

Yucca, a genus of Liliaceæ, natives of the United States, Mexico, and Central America, some of which are often cultivated in gardens on account of the singularity and splendour of their appearance. The genus most likely arose in the Mexican tableland and spread northwards. Those species

that have taken the form of small trees find their centre of distribution and their most luxuriant development in the Chihuahua desert. *Y. gloriosa* and *Y. recurvifolia* are found on the coastal plains east of the Mississippi; *Y. louisiana* and *Y. arkansana* inhabit the country along the Red River, west of the Mississippi; *Y. glauca* is characteristic of the plains of Texas, Kansas, and Lower California. No Yucca is known south of Guatemala, where *Y. elephantipes* reaches the greatest vegetative development of the genus. *Y. gloriosa* is quite hardy in England, so as sometimes to flower luxuriantly in the open air. It has a stem about 2 or 3 feet high, the upper part of which produces a great tuft or crown of large sword-shaped evergreen leaves, each terminating in a sharp black spine. From the centre of this crown of leaves arises the flower-stalk, of 3 feet or upwards in height, branching out on every side so as to form a great panicle. The flowers are white with a purple stripe. The other species, of which there are some twenty, have a general resemblance to this in habit and appearance. Some of them reach a height of 50 feet, with a stem 5 feet thick. *Y. australis* is called Spanish Bayonet or Mexican Banana, and yields an edible fruit. *Y. aloifolia* is a very decorative species. The fibre of the Yuccas is similar to that of the Agaves and Bromelias, and is used for coarse cloth and cordage.

Yucca gloriosa superba.
(From a Photograph taken in the open air near Edinburgh in 1890.)

Yugoslavia, Yugoslavs. See SERBIA.

Yukon, a river formed by the junction of the Lewes and Pelly at Selkirk in Canadian territory flows W. across Alaska, into Behring Sea. Its length is some 2300 miles; in its lower course it is more than 20 miles wide, and for 400 miles from 1 to 4 miles wide. Part of the year its waters swarm with salmon. Steamers continue down the Yukon below Dawson to the mouths of the river, where deposits of mud and silt have formed a great delta. Ocean steamers stop at an island 60 miles from the delta, and transfer their goods and passengers to flat-bottomed river steamers. See YUKON TERRITORY.

See Ogilvie, *Early Days on the Yukon* (1913); Stuck, *Voyages on the Yukon and its Tributaries* (1919). See also ALASKA.

Yukon Territory, the extreme north-west portion of the Dominion of Canada, is bounded on the S. by British Columbia, and Alaska, U.S.A., on the W. by Alaska, on the N. by the Beaufort Sea, on the E. by the North-west Territories. It was declared a separate political unit in 1898. On the SW. of Yukon is the coast range of mountains, and here are found the highest peaks in North America, including Mount Logan (19,539 ft.), Mount St Elias (17,978), and Mount Hubbard (16,400). The climate is healthy, the summer though short being unexcelled, while the winter is cold but bracing. The snowfall is light. Vegetables grow to perfection, while berries of various kinds abound. Oats and barley can be cultivated. Game is varied and plentiful, and much trade is done in furs. Yukon is best known for the famous Klondike (q.v.) gold mines, which are now, however, becoming exhausted, but coal, copper, silver, and lead are also mined. The government consists of a commissioner and a council, while one member is sent to the Dominion House of Commons. The capital is Dawson (pop. in 1921, 975) on the river Yukon. Steamers connect Vancouver with Skagway in south Alaska, the harbour of which is open all the year round, and there is a railway between Skagway and White Horse in Yukon. Land area, 206,427 sq. m.; pop. (1921) 4157.

Yule, the old name for Christmas, still used provincially, as well as in Yule-log, Yule-cake, Yuletide. For the nature of the old heathen festival, and the way in which the observances were overlaid or transformed by the Christian institution, see CHRISTMAS; and Tille, *Yule and Christmas* (1899).

Yule, SIR HENRY (1820–89), was born at Inveresk near Edinburgh, the son of a major in the Company's army; he himself received a cadetship in the Bengal Engineers, served with distinction on the north-east frontiers, the great irrigation works in the North-western Provinces, on the mountain surveys in Arakan and Burma, and during the Mutiny. He was Secretary to Government in the Public Works department, sat on the Indian Council from 1875 until 1889, and was made K.C.S.I. on his retirement. He wrote valuable Introductions for several books of Asiatic travel. His *Cathay and the Way Thither* (1866; new ed. 1914), prepared the way for his magistral *Book of Ser Marco Polo the Venetian* (1871). His *Anglo-Indian Glossary* (with Dr Burnell, 1886), is better known as *Hobson-Jobson* (3d ed., with Life by his daughter, 1903).

Yuma, a mining city, capital of a county in the south-west of Arizona, where the Gila flows into the Colorado, one of the hottest places in the United States; pop. 4000. The Yuma Indians are agriculturists of fine physique.

Yunnan, a province in the south-west of China, bounded on the S. by French Indo-China and Burma, with an area estimated at 147,000 sq. m., and a population estimated at 8,000,000 to 11,000,000, having sunk from 15,000,000 through plague and the war of the Mohammedan Panthays which smouldered from 1855 till 1872. The surface is mainly an extensive uneven highland plateau, in which the main ranges trend north and south. Between these ranges, which vary in height from 12,000 to 17,000 feet in the north to 7000 or 8000 in the south, are numerous deep defiles through which run some of the largest rivers of Indo-China—the Mekhong, the Salwin, and others. Fertile plains and valleys are numerous. In the northern part the surface is wild, broken, and barren, wrapped in mist and fog, and the population sparse. But the south and south-west are populous and richly cultivated. Except in the cities the mass of the people is made up of aboriginal Shans, Lolos, and Miautsé (q.v.). Many are Mohammedans. In the plains rice, wheat, maize, peas, beans, tobacco, sugar, tea, silk, and cotton are produced. The mineral wealth is very great, especially in coal, copper, lead, zinc, silver, with gold, salt, and petroleum. The main routes available for tapping

the wealth of Yunnan are by the Yang-tsze River, from Shanghai; by the Canton River, from Canton; by the Songkoi River, and by railway (1910), from Tongking; and by the Bhamo route, from Bhamo on the Irawadi. A railway for Burma has long been talked of, but the difficulties are great. —Yunnan-fu, the capital, with its walls, gates, and prosperous population of 150,000, stands near the NE. shore of the lake Tien-chih (1400 sq. miles), draining to the Yang-tsze. It was nearly ruined during the Mohammedan rebellion. See works by Colquhoun (1883), H. R. Davies (1909), R. F. Johnston, A. Little (1910, which describes the troubles overcome in making the French railway from Hanoi and Haiphong); Legendre, *Au Yunnan* (1913).

Yuriev. See DORPAT.

Yurievski, a family sprung from Alexander II. of Russia and Princess Dolgoruky (q.v.).

Yuruari. See VENEZUELA.

Yuste. See CHARLES V.

Yúsufzáis. See AFGHANISTAN.

Yverdon (also spelt *Yverdun*), a pleasant Swiss town of 9000 inhabitants in the Canton of Vaud, at the southern end of the Lake of Neuchâtel, 20 miles N. of Lausanne. The old castle, built in 1135, was used by Pestalozzi (q.v.) as an educational institute. There are sulphur baths quite near.

Yvetot, an old town of France, in the dept. of Seine-Inférieure, 24 miles NW. of Rouen, with textile manufactures; pop. 7500. The town and territory of Yvetot was long a semi-sovereign principality, and the Lord of Yvetot was popularly styled 'Roi d'Yvetot.' Béranger's well-known song, with that title, translated by Thackeray, was a satire on Napoleon.

Z

the twenty-sixth and last letter of our alphabet, descends from the seventh letter of the ancient Semitic alphabet, named in Hebrew *záyin*, in Syriac *zain*. The word is in Syriac the general term for a weapon; in early Semitic it may have denoted some particular weapon of which the early form of the letter, I, was intended as a representation, but this is merely a conjecture. In the ordinary Hebrew character the form is ז.

The original sound of the letter was probably that of the English *z* (=voiced *s*). This sound did not exist in Greek, and the letter I, which afterwards became Z, was used by the Greeks for a compound consonant, which may have been originally *dy* or *dzh* (=English *j*), but afterwards became *dz*. In the 4th century of our era it was pronounced as the English *z*, and was adopted with this value in the Gothic alphabet. The Greek name *zēta* is probably an assimilation of the Semitic name to the names of the two following letters, (*h*)*ēta* and *thēta*.

The Romans adopted Z with the rest of the Greek alphabet, but as it was useless in Latin it was abandoned, its place as the seventh letter being given to G. At a late period the letter was adopted afresh from Greek, to serve in the transliteration of Greek words, and was placed at the end of the alphabet. In mediæval writing the lower horizontal line was curved backward, and sometimes converted into a loop to join it to a following letter, while the general outline was rounded. Hence arose the forms still used in German type (ℨ, ȝ) and in English handwriting (ȝ).

In late Latin the letter was pronounced *ts*. With this value it was adopted in Old English, but was very rarely used. In Old and Middle High German it had two sounds: that of *ts* (which it retains in modern German) and that of a strong *s*. Modern grammarians and editors of texts distinguish the latter sound by using the special form ʒ.

In modern German black-letter and German script the ligature ß (=*sz*), is used instead of ſſ (*ss*), when final and after a long vowel; when 'Latin' characters are used, some writers employ *sz*, and some others ß, but usually *ss* is preferred.

In Italian Z has two values, *ts* and *dz*. In Spanish the original sound of *ts* has become *th*.

In early Old French Z was pronounced *ts*, but this combination of sounds became obsolete in French in the 12th century, being replaced by *ss*. From causes that are still obscure, Z came to be used in French for the voiced *s*; hence its present use in English, which dates from the early 14th century. In Polish and Bohemian the letter has the same sound as in English; the sound of *zh* (=English *s* in *pleasure*) is written *ż* in Polish and *ž* in Bohemian. For the pronunciation of *cz*, *rz*, *sz* in various languages, see the articles on C, R, S.

In English handwriting of the 15th century the form of the letter was often identical with that of *ȝ* (see G), one of the sounds of which was the consonant *y*. To confusion between the two letters is due the use of *z* for *y* in some Scottish surnames, as Menzies, Dalziel.

The Greek name of the letter was adopted in Latin, and is represented by the Italian *zeta*, the Spanish *zeda*, the German *zet*, the French *zède*, and the English *zed*. The last, which is now universal in England, is mentioned by Shakspere, and is doubtless as old as the present pronunciation of the letter. As, however, the *z* sound in an initial position was in Early English confined to the Southern dialect, this name was in the North and Midlands replaced by various disyllabic forms, *ezed*, *ezod*, *izzet*, *uzzit* (corruptly *izzard*, *uzzard*). In Johnson's Dictionary *izzard* (absurdly said to be for '*s* hard') is stated to be more commonly used than *zed*. In the United States the letter is always called *zee*.

Zaandam, a town in the province of North Holland, on the Zaan, at its entrance into the Y, 5 miles NW. of Amsterdam by rail. Many of its wooden houses, mostly painted white or green, are separated by canals, and with their gardens round them look like little islands. It has many corn, oil, and saw mills, in whose products an active trade is maintained. Most of the sixty wharves it had in the 17th century have disappeared, and its famous whale-fishery is also a thing of the past. Here in 1697 Peter the Great worked in one of the shipbuilding yards as a carpenter, and the hut in which he lived is preserved. Pop. 30,000.

Zabern (Fr. *Saverne*), a town of Lower Alsace (Bas Rhin), 22 miles NW. of Strasburg by rail, once residence of the bishops of Strasburg, and now a busy manufacturing centre, famous for its tools and agricultural implements. An incident in 1913 drew attention in Germany and elsewhere to the arrogance of the military class; nor has Zabern been content under French rule. Pop. 9000.

Zabrze. See HINDENBURG.

Zacate'cas, capital of a state of that name in Mexico (q.v.), and a famous silver-mining town, is situated in a deep ravine, 440 miles by rail NW. of Mexico city. The streets are narrow and irregular, but there are numerous squares, and the market-place, where the cathedral stands, is wide and handsome. Three miles to the east is the Franciscan college where the fathers of the old Californian missions were trained. Zacatecas is the great silver-producing state of Mexico, and around the city many thousands are employed in the mines, which have been worked since 1540. Pop. 15,000. The state has an area of about 24,500 sq. m. and a pop. of 373,000.

Zachariæ von Lingenthal, KARL SALOMO (1769–1843), German jurist, was born at Meissen, Saxony, studied at Leipzig University, and became professor of law at Wittenberg in 1797 and at Heidelberg in 1807. He enjoyed a European reputation with his *Einheit des Staates und der Kirche* (1797), *Die Wissenschaft der Gesetzgebung* (1806), *Vierzig Bücher vom Staate* (1839–42), &c. See *Étude* by Brocher (1870).—His son KARL

EDUARD (1812–94), born at Heidelberg, also a jurist, made a special study of Roman and Byzantine law, and published an exhaustive collection of Byzantine law-books, *Jus Græco-Romanorum* (1856–1891); also *Historiæ Juris Græco-Romani* (1839), *Geschichte des griechish-römischen Rechts* (3d ed. 1892), two standard books on the subject.

Zacharias, pope from 741 to 752, was a Greek by birth. He gave his consent to the setting aside of the Merovingian Childeric III. and the elevation to the throne of Pepin the Short (752). He died at Rome, 14th March 752. See books by D. Bartolini (1879) and I. Cozza-Luzi (1880).

Zacynthus. See ZANTE.

Zadar, Croatian name of Zara (q.v.).

Zadkiel, the name assumed by Richard James Morrison, the compiler of an astrological almanac, which was started by him in 1830, and which reached a yearly sale of from 100,000 to 200,000 copies. He was a retired commander in the royal navy, a Hebraist, mathematician, and astronomer, withal a real believer in his pseudo-science, as was brought out in his action for libel against Sir E. Belcher (1863). He was born about 1794, and died on 5th February 1874. See CRYSTALLOMANCY.

Zadonsk, a Russian town on the Don, 70 miles N. of Voronezh, is the seat of a celebrated monastery. Pop. 10,000.

Zadruga. See SERBIA, p. 260.

Zafarâni Islands (Sp. *Chafarinas*), three islets off the north coast of Morocco, occupied by Spain. Pop. 300.

Zaffre. See COBALT.

Zagazig, a town of the Egyptian delta, capital of a district and an important railway centre, 50 miles NE. of Cairo, on a branch of the Sweetwater Canal connecting Ismailia with the Nile. There is a large trade in cotton. It was occupied by the British troops immediately after the battle of Tell el-Kebir. Pop. 42,000.

Zaghul, SAAD (1860–1927), Egyptian pasha, born of well-to-do parents in Ibian district, Gharbia province, studied at the university of El Azhar, Cairo, and was called to the bar in 1884. In 1906 he was appointed minister of education, but later became the leader of the extreme Nationalists. After the Great War he was twice deported (1919, 1921–23) by the British, and twice came to London (1920, 1924) for discussions, first with Lord Milner, and then with Mr Ramsay MacDonald, then premier. Zaghul obtained a huge majority at the Egyptian elections in January 1924, but resigned the premiership in November 1924 after the murder of Sir Lee Stack, the sirdar. After a set-back in 1925, he again swept the polls in 1926; but again Britain intervened and forced him to renounce office.

Zagreb, Zágráb, Croatian and Magyar names of Agram (q.v.).

Zagreus. See DIONYSUS, MYSTERIES, ORPHEUS.

Zahn, THEODOR VON, a biblical scholar of unrivalled acuteness and learning, was born at Mörs in Rhenish Prussia, October 10, 1838; studied at Basel, Erlangen, and Berlin (1854–58); became *repetent* at Göttingen in 1865, *privat-docent* in 1868, and professor extra-ordinary of Theology in 1871; and obeyed calls to Kiel in 1877, to Erlangen in 1878, to Leipzig in 1888, and back to Erlangen in 1891. Of his writing the most important are *Marcellus von Ancrya* (1867), *Der Hirt des Hermas* (1868), *Ignatius von Antiochien* (1873), *Acta Joannis* (1880), and *Cyprian von Antiochien und die Deutsche Faustsage* (1882), which worthily prepared the way for those splendid comprehensive works devoted to the New Testament Canon which have placed him amongst the first scholars of his time—*Forschungen zur Geschichte des Neutestamentlichen Kanons* (7 vols. 1881–1907), including *Tatian's Diatessaron*, &c.; the *Geschichte des Neutestamentlichen Kanons* (2 vols. 1888–92). Zahn edited the huge *Kommentar zum Neuen Testament* (1903-27), besides writing some of the volumes himself. Together with Gebhardt and Harnack he edited the *Patrum Apostolicorum Opera* (3 vols. 1876–78).

Zähringen, a small village a mile N. of Freiburg im Breisgau, historically noteworthy for the ruined castle of the dukes of Zähringen, the ancestors of the late reigning House of Baden (q.v.).

Zaimis, ALEXANDER, Greek statesman, was born in 1855 at Athens, was high commissioner of the powers in Crete 1906–11, and in 1913 was appointed governor of the National Bank. He was premier of Greece 1897–99, 1901–02, for brief spaces in 1915, 1916, and 1917, and took office again in 1926.

Zaire. See CONGO.

Zaleucus, the legendary lawgiver (*c.* 650 B.C.) to the Epizephyrian Locrians, the Locrians who colonised the SW. extremity of Italy.

Zama, a city and fortress in Numidia, about 100 miles SW. of Carthage, near which Hannibal (q.v.) was defeated by the Younger Scipio, 201 B.C.

Zambezi, Vasco da Gama's 'River of Good Signs,' a river of great importance in Central Africa, has a total length of some 1600 miles. It rises in Angola near where Angola, Belgian Congo, and Northern Rhodesia meet, flows south through marshy tracts in Barotseland, and then strikes east, dividing Northern from Southern Rhodesia. At Feira it enters Portuguese East Africa; and it empties itself by a delta into the Mozambique Channel in the Indian Ocean. The Zambezi River drains nearly 1,000,000 sq. m. of territory. Of its principal tributaries, the Labompo flows SW. through Barotseland, the Chobe NE. through a marshy region of Bechuanaland, the Wanke N. through a coal region of Southern Rhodesia, the Kafue and Loangwa S. through Northern Rhodesia, and the Shiré (q.v.) S. from Nyasaland. None of these rivers are of much use as regards navigation, being mostly either too rapid or too shallow, while the Zambezi itself is much interrupted with cataracts and rapids, of which the largest are the Kebrabasa Rapids (some 60 miles in length) in Portuguese E. Africa, and the famous Victoria Falls (*Mosioatunya*, 'sounding smoke'), about 800 miles from the ocean. These falls, grander and greater than those of Niagara, were discovered and named in 1855 by Livingstone; the river, here over a mile broad, drops sheer into a huge chasm varying from 256 to 343 feet in depth, and then enters a gorge only 100 feet wide. The Zambezi delta (area, 2500 square miles) has numerous mouths, all more or less blocked with sand, the Chinde mouth being the most accessible, but right up to the Kebrabasa Rapids the river can only be used by boats of shallow draught. From these rapids to the Victoria Falls it is both deep and broad, but various rapids prevent continuous communication, while the marshy Upper Zambezi only forms a partial waterway. East of Livingstone (the capital of Northern Rhodesia), the Zambezi drains a considerable mineral-producing country (coal, gold, copper, &c.). Zumba, Sena, and Tete in Portuguese E. Africa are all important towns, especially the last-named for its coal-fields, but the prosperity of Chinde has rather declined with the construction of the Trans-Zambezia railway. When the Zambezi has been bridged, either at Chindio or Sena, Blantyre in

Nyasaland will be brought by this railway into direct communication with the port of Beira. The Rhodesian railway system crosses the river by a girder bridge (400 yards below the Victoria Falls, and 420 feet above the water, the central span being 500 feet), which was finished in 1905.

See the Travels of Livingstone, &c.; Rankin, *Zambezi Basin* (1903); for the Upper Zambezi, see Gibbons, *Africa from South to North* (1904); for the Middle Zambesi, works cited at RHODESIA; for the Lower Zambezi, Maugham, *Zambezia* (1910).

Zambezia. See RHODESIA.

Zamenhof, LAZARUS LUDOVIC (1859–1917), the inventor of the international language, Esperanto (q.v.), was born of Jewish parents at Bialystok, Poland, and in 1886 began to practise as an oculist in Warsaw, where he lived for most of his life. Esperanto was first published in 1887, and Dr Zamenhof took a prominent part in the Esperanto Congress at Boulogne in 1905 and subsequent congresses. He wrote in Esperanto both original poems and translations from various languages.

Zamia. See CYCADS.

Zamora, a very ancient town of Spain, capital of a province, is on the Douro, 150 miles NW. of Madrid by rail. It is the see of a bishop suffragan of Santiago. Zamora was of great importance in the Moorish times, was strongly fortified, and has many interesting remains of mediæval architecture. The cathedral (finished 1174), with a late 15th century chancel and choir, and the smaller church of La Magdalena are Romanesque in design. There are some linen and woollen manufactures. It has never recovered from the devastations of the French (1808–9). Pop. (1920) 17,567. The *province* is agricultural, and wine is produced; area 4097 sq. m.; pop. 266,215.

Zamość, a town of Poland, 154 miles SE. of Warsaw, formerly strongly fortified. Pop. 19,000.

Zamoyski, JAN (1541–1605), Polish statesman, was born at Skokow of noble family, was an accomplished jurist, was the chief counsellor of King Stephen Báthory throughout his reign (1575–86), largely procured the election of King Sigismund III., and strongly opposed any Austrian or Turkish influences on Poland.

Zanardelli, GIUSEPPE (1826–1903), Italian lawyer and statesman, born at Brescia, was elected liberal deputy for the Turin parliament of 1861, and after 1876 held various ministerial appointments. He was three times president of the Italian Chamber, and premier 1901–3.

Zanella, GIACOMO (1820–88), Italian lyrical poet, was born at Chiampo, bred a priest, and in 1866 became professor of Italian Literature at Padua.

Zaneville, capital of Muskingum county, Ohio, on the Muskingum River at the mouth of the Licking, 52 miles E. of Columbus. The river, navigable to this point, is crossed (amongst others) by an iron railway bridge (538 feet long) to the suburbs of Putnam and West Zanesville. Zanesville has rich coal-mines close by, and manufactures extensively tiles, bricks, engines and boilers, flour, iron, cottons and woollens, glass, &c. The flood of March 1913 was very destructive here. Pop. (1880) 18,113; (1920) 29,569.

Zanguebar. See ZANZIBAR.

Zangwill, ISRAEL (1864–1926), born of Jewish family in London, was mainly self-taught but graduated with honours at London University, and, after some experience in teaching, became an active journalist. He first became known by his vivid novels of Jewish life, *Children of the Ghetto* (1892), *King of Schnorrers* (1894), *Dreamers of the Ghetto* (1898). Other novels were *The Master* (1895), *Mantle of Elijah* (1900), while a long series of plays included *The Melting Pot* (1908), *The War God* (1911), *Too Much Money* (1918), *We Moderns* (1925). Zangwill wrote and lectured considerably, too, on Jewish political problems, and founded the Jewish Territorial Organisation to establish a Jewish national settlement in some free untouched part of the world. He regarded the post-war Zionist settlement in Palestine as too much in the nature of a compromise. See ZIONISM.

Zan'te (anc. *Zacynthos*), one of the principal Ionian Islands, 9 miles from the north-west coast of the Morea, and 8 south of Cephalonia, is about 24 miles long, 12 broad, and has a pop. of 40,000. In the west it attains a maximum altitude of 2486 feet; the centre is fertile, formed by depression, and is mainly devoted to the growing of the dwarf species of vine, originally brought from Corinth, from which *currants* are produced, but olives and other fruits are also cultivated. Zante is mentioned in Homer with the epithet 'woody,' which is not apt at the present day, although it is justly called in an Italian proverb 'the flower of the Levant.' It is not volcanic, although thought to be so by the natives from the pitch-wells and the not infrequent earthquakes. Currants are largely exported, mostly to England, where, according to Lithgow the traveller, they were first introduced from Zante about 1550.—ZANTE, the capital, is situated at the head of a small bay on the east coast. Pop. 13,500. See IONIAN ISLANDS.

Zanthoxylum, a genus of Rutaceæ, of which many species are found in Brazil and the West Indies. In the United States the best known is the Prickly Ash or Toothache Tree (*Z. americanum*), the bark and its extracts being used for toothache and rheumatism, and also as a tonic. The fruits of *Z. Bungei* are a prized condiment of the Chinese. Some species are called Fustic, Pepper, Yellow-wood, &c. The form Xanthoxylum, though better Greek, is rejected by botanical nomenclators.

Zanzibar (Swahili *Unguja*), a British Protectorate in Africa under a native sultan, consisting of the islands of Zanzibar and Pemba. With the Kenya Colony and Protectorate, and the Uganda Protectorate, it constitutes British East Africa. Zanzibar Island, separated from the mainland by a deep channel about 22 miles wide at its narrowest part, rests upon a coral foundation and rises in the interior to 425 feet; area, 640 sq. m.; pop. (1924) 129,140. Pemba Island lies some 25 miles to the NE.; area, 380 sq. m.; pop. (1924) 87,650. The people are chiefly Swahili (q.v.), but the governing class and landlords are Arabs, while there are a certain number of foreign and European traders. During the harvesting season labour has to be imported from the mainland. The legal status of slavery was abolished in 1897. Most of the natives are Mohammedans (Sunnites, q.v.), but Christian missions have been established. The Protectorate is administered by a British resident (directly responsible to the Colonial Office), and in 1926 executive and legislative councils were established, the former presided over by the sultan, the latter by the resident. There are both government and mission schools; and courts of justice, some administered by the sultan and others by the resident. The principal exports are cloves (see PEMBA), copra, soap, oil, and ivory, while piece goods, rice, and sugar are imported. About a third of the trade is done with India and Burma, while more than half the revenue comes from the customs. The climate, both hot and moist, is unfavourable for Europeans. Zanzibar town (pop. 38,700), the capital of the Protectorate, is situated on an island-studded bay on the west side of the island of the same name. The town still retains considerable

importance as a shipping centre and port of call, despite the rivalry of Mombasa and Dar-es-salaam.

Zanzibar means the 'land of the Zenj,' a reigning dynasty, probably of Swahili origin, who ruled a somewhat indefinite area of the African coast regions. Ultimately *Zanguebar* was the term usually given to the continental portion as distinguished from the island. There were Arab settlements in various places as early as the 10th century. By the end of the 15th century the Portuguese made their influence felt, and in 1505 were recognised by the Mohammedans on the island as paramount. In the 17th century the Portuguese lost most of their dominions north of Mozambique to the Imam of Muscat (q.v.), and many small states were founded. In 1832 Seyyid Said of Muscat made Zanzibar town the capital of his dominion, but with the accession in 1856 of his younger son Medjid, the dependence of Zanzibar came to an end. At the same time, however, the mainland possessions in Africa gradually dwindled away till they amounted only to a strip of coast, extending 10 miles inland from Cape Delgado to Kipini. In 1890 Zanzibar was definitely declared a British Protectorate, and the same year the strip of mainland was divided between Great Britain, Germany, and Italy. The two latter powers, at different times, bought their rights for a capital sum, but Great Britain still pays an annual rent to the Zanzibar treasury. Various changes in the constitution of the Protectorate were effected in 1904, 1906, 1913 (when the control was transferred from the Foreign Office to the Colonial Office), and 1925 (when the High Commissionership of the Governor of Kenya was abolished).

See the Travels of Burton, Speke, Stanley, &c.; Newman, *Transition from Slavery to Freedom* (1898); Lyne, *Zanzibar during 19th Century* (1905); Craster, *Pemba* (1913); Ingrams, *Zanzibar* (1924); and two standard books on Zanzibar by F. B. Pearce (1920, 1924).

Zápolya, JOHN. See HUNGARY, p. 5.

Zaporogians. See COSSACKS, RUTHENIANS, UKRAINE.

Zara, a city on the coast of Dalmatia, annexed to Italy (with a few miles of territory surrounding it) in 1920, 87 miles ENE. of Ancona, from which it is most easily accessible by steamer, and 130 miles ESE. of Trieste. It lies on a rectangular island, now joined to the mainland, the moat of the Venetian fortress at the south extremity of the town having been partly filled up. The fine cathedral, originally a Byzantine building, was rebuilt in the Romanesque style, and consecrated in 1205; while the elaborate façade dates from 1323, and the lofty campanile, begun in 1452, was only completed in 1893. The interior has finely carved wooden choir stalls. The crypt is of the 8th century, and the hexagonal baptistery, in brick, of the 6th–7th centuries. Other noteworthy churches are S. Francesco, Sta Maria (with a campanile of 1105), S. Simeone, and S. Crisogono. The circular church of S. Donato, probably dating from the 9th century, was built over a pavement which is probably that of the ancient forum, and is architecturally interesting: it now contains the archæological museum. There are other Roman remains of less importance. The general aspect of the town, with its narrow streets, in most of which wheeled traffic cannot pass, is that of a Venetian city; and much of the architecture is Venetian Gothic. The ancient city (*Jader*) was the capital of the Liburni: it became a flourishing Roman colony, and after the fall of the empire became Byzantine. After the first crusade it belonged alternately to Hungary and Venice, until the latter bought it from the former in 1409. It passed to Austria in 1797, to Italy in 1805, to Austria again by capture in 1813, and by treaty in 1814, and after the Great War again to Italy by the treaty of Rapallo (1920). The chief manufacture is that of maraschino. Pop. (1921) 17,065. The district has an area of 42 sq. m., and a population of 18,623.

Zarafshan. See BOKHARA.

Zaragoza. See SARAGOSSA.

Zaria, a province of northern Nigeria, noted for its large cotton crop, formerly one of the original Hausa (q.v.) states. Area 22,000 sq. m.; pop. 340,000.

Zarlino, GIOSEFFO (1517–90), Italian composer and musical theorist, was born at Chioggia, entered holy orders, studied music under Willaert, and was choirmaster of St Mark's, Venice, from 1565 till his death. In his treatises Zarlino proposed the compromise of equal temperament, and realised the greater possibilities of the Ionian (the modern diatonic scale) as opposed to the other modes. See HARMONY, TEMPERAMENT.

Zarncke, FRIEDRICH, Germanist, was born at Sahrenstorf near Brüel in Mecklenburg-Schwerin, 7th July 1825. He studied at Leipzig and Berlin, settled at Leipzig in 1850, founded the *Litterarisches Zentralblatt für Deutschland*, and became in 1858 ordinary professor of German Language and Literature at the university there. Here he died, 15th October 1891. His writings include a treatise on the German *Cato* (1852); an edition of Brant's *Narrenschiff* (1854); treatises on the *Nibelungenlied* (1857), and many contributions to a knowledge of such mediæval German writings as the Old Saxon *Hêliand*, the O. H. Ger. *Muspilli* and *Georgslied*, &c., in the *Abhandlungen* of the Saxon Academy of Sciences, and elsewhere; mediæval poetical proverbs (1863–65); the history of Leipzig university (1857), and the mediæval German universities (1857); and Prester John (in various dissertations, 1876–79 *et seq.*). Other works were a study of Christian Reuter (1884) and his *Kurzgefasstes Verzeichniss der Originalaufnahmen von Goethes Bildniss* (1888).

Zarskoe. See TSARSKOYE SELO.

Zaruma, a town of Ecuador, founded in 1549, on the west slope of the Andes, 95 miles S. of Guayaquil. It has gold and quicksilver mines, which are fairly productive, and grows cane and fruits for sugar. Pop. 6000.

Zea. See CEOS; and for the grain, see MAIZE.

Zealand (Dan. *Sjælland*), the largest and most important island of Denmark, lies between the Kattegat and the Baltic, and is separated by the Sound from Sweden and by the Great Belt from Fünen. Length, 81 miles; extreme breadth, 67 miles; area, 2670 sq. m.; pop. (including the small islands of Möen, Samsö, &c.) 1,270,000. The surface is nearly everywhere flat, except in the northern peninsulas; the coasts, which are rockbound on the south-east, are indented by bays and fiords, the chief of which is the Roeskilde-Isefiord in the north. The rivers are small, but there are numerous lakes, and all the waters abound in fish. The island contains several beech-forests, is exceedingly fruitful in corn (particularly barley and rye), and breeds excellent horses and cattle. Agriculture and cattle breeding are the principal employments of the inhabitants. The chief place is Copenhagen (q.v.), on the east coast; the next in rank and size are Elsinore (Helsingör) and Holbaek in the north and Korsör in the south-west.

Zealand in the Netherlands. See ZEELAND.

Zebid, a small Arabian town in Yemen, on the inland route from Hodeida to Mocha, from which

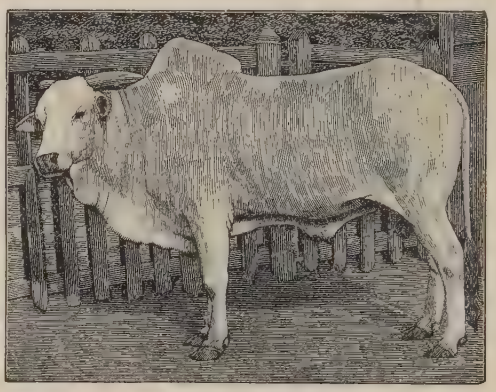
last it is 60 miles north, once famed for its commerce and its learning, and the seat of a long line of princes.

Zebra, a general name for the African striped Equidæ, including the Mountain Zebra (*Equus zebra*), the Burchell Zebra (*E. burchelli*), and Grévy's or Somali Zebra (*E. grevyi*), and varieties of these, like Chapman's and Grant's. The extinct Quagga (q.v.) was another species. Zebras are more asinine than equine, as is particularly well seen in the Mountain Zebra, where the ears are long, the mane is short, and the tail is tufted. No

Zebra (*Equus zebra*).
(From a Photograph by Gambier Bolton, F.Z.S.)

zebra or ass ever shows the hock callosities that mark the horse, *Equus caballus*. The Mountain Zebra, once common in Cape Colony and Natal, the 'Wilde Paarde' (wild horse) of the Dutch, has a general ground colour of white, crossed by black stripes broader than the intervening spaces; the body-stripes are all nearly perpendicular; those of the legs are horizontal down to the hoofs. There is a very narrow dorsal band and a distinctive 'gridiron' pattern of transverse stripes running across the top of the loins, croup, and base of the tail. It never frequented the plains as the others did, but is emphatically a mountain animal. It still survives in small troops, frequenting the most rugged and inaccessible mountain-ranges of South Africa and Angola, but its occurrence is now much restricted, and will, apparently, not long hence cease entirely. Its activity and surefootedness are remarkable, its senses of sight, smell, and hearing very acute, and the least alarm is sufficient to send the whole herd scampering off, with pricked ears and whisking tails, to inaccessible retreats among the mountains. The zebra has been tamed and driven in harness, and in the old days the young were for this purpose captured by the Boers and exported to Mauritius; but even when taken young the temper is always vicious and uncertain. The zebra and the pony may be crossed with success, but the progeny are not of special value. See Cossar Ewart, *Penicuik Experiments* (for zebra-horse hybrids); Ridgeway, *Origin of the Thoroughbred Horse* (1905); Pocock, *Ann. & Mag. of Nat. Hist.* xx. (1897).

Zebu (*Bos indicus*), a species of ox nearly allied to the European *Bos taurus*. It is also called the Brahmini Ox, and the pampered sacred bulls of the Hindus belong to this species. The most conspicuous distinctive character is a large fatty hump on the back above the shoulders. The horns are often very short; the ears are long and pendulous; the dewlap begins close to the chin and is strongly developed; and the legs are rather more slender than in the European ox. The hump attains a great size in animals plentifully supplied with food



Zebu (*Bos indicus*).
(From a Photograph by Gambier Bolton, F.Z.S.)

and not compelled to work; it is a favourite dish in India. The zebu is diffused over India, China, the Asiatic Islands, Madagascar, and the east coast of Africa. There are many breeds, differing in size, colour, and horns. Probably none are any longer truly wild, but some have become feral.

Zebu, one of the Philippine Islands (q.v.).

Zecchino. See DUCAT.

Zechariah, 'the son of Berechiah, the son of Iddo' (the priest of Neh. xii. 4), was born in Babylonia during the captivity, and accompanied the first band of exiles on their return to Judæa under Zerubbabel and Joshua. Nothing further is known of his personal history except that, along with Haggai, in the second and fourth years of Darius Hystaspis (520–518 B.C.), he as a prophet stirred up the languishing enthusiasm of the Jews to complete the rebuilding of the temple. Of the book that bears his name (eleventh in order among the twelve minor prophets) only the first eight chapters are really attributable to him. They consist of three parts under three separate dates: i. 1–6; i. 7–vi. 15; and vii., viii. The first is a brief exhortation to repentance; the second, forming by far the larger portion of his prophecy, is made up of eight visions relating to the speedy rebuilding of the temple, the scattering of Israel's enemies, the future greatness and glory of Jerusalem, the priestly dignity of Joshua and the advent of the Messiah, the removal of all wickedness out of the land, and the execution of God's judgments on Babylonia; the third contains a hopeful deliverance on the question as to the permanence of fast days, and gives a bright picture of the Messianic future.

The remaining six chapters of the Book of Zechariah are now regarded with practical unanimity as being really anonymous: they have a different horizon, belong to a different school of prophecy, and are separated also by their language and style from the compositions of Zechariah 'the son of Iddo.' They must have been added to the growing book of the minor prophets at a time when the genuine prophecies of Zechariah had already become part of it, and thus according to the usual custom of those times came to be attributed to the last preceding writer whose name was known. They naturally fall into two sections now commonly attributed to two distinct authors. The

first of these, consisting of chapters ix.–xi., to which it has been usual, since Ewald, to add xiii. 7–9, may be thus analysed: ch. ix. predicts the judgment about to fall on Damascus, Hamath, Tyre, Sidon, and Philistia, and foretells the advent of the Messiah, the restored prosperity of Judah and Ephraim, and their triumph over the sons of Greece; ch. x. exhorts to trust in Jehovah and warns against 'teraphim and diviners,' through whom Israel has fallen under unworthy rulers; new and better rulers are to be raised up, under whom Judah and Ephraim are to be reunited; ch. xi. begins with allusions to war in the north and east, but is chiefly occupied with the difficult allegory of the shepherd, to which also xiii. 7–9 seems to belong. In modern times the prevailing opinion until recently was that these chapters belong to the second half of the 8th century B.C. In support of this view it was pointed out that the northern kingdom is still apparently in existence, that Assyria and Egypt figure much as they do in Amos, Hosea, and Isaiah, and that the teraphim and diviners also indicate a comparatively early date. But there are other circumstances, on the other side, that point to a rather late date after the exile, the most important being the reference to the Greeks, which would be most appropriate to the Macedonian period. Driver accordingly inclined to think, with Cheyne and Kuenen, that, while the prophecy as a whole dates from the 8th century, it was yet modified in details, and accommodated to a later situation, by a prophet living in the post-exilic period when the Greeks had become formidable to the Jews. As for ch. xii. 1–xiii. 6, xiv., this section of the book used to be assigned to the last days of the Judean kingdom, but is now very generally considered to be post-exilic. It presupposes a state of matters in Judah and Jerusalem of which we have no knowledge, but which may possibly have occurred during one or other of the obscure periods—518–458 or 432–300 B.C. Stade thinks of the year 300 B.C. as an approximate date for this section. As regards all six chapters, though assigning them to two separate authors, Wellhausen argues for a very late date—as low indeed as that of Antiochus Epiphanes—on a variety of grounds, such as the type of eschatology employed (which was that introduced by Ezekiel), the importance assigned to the temple service, the absence of an actual Davidic king, the allusions to the 'race of Ashdod' (comp. Neh. xiii. 23, 24), to Greece, and to idolatry (of which there was a revival late in the Macedonian period). The presence of phrases suggestive of the older prophecy, and the allusions to Ephraim, Assyria, and the like he explains by the desire of the author 'to give his oracles an archaic garb,' thus inverting the theory of Kuenen, Driver, and others that the oracles are really old, but with later elements superadded. The evidence is certainly conflicting, and the problem may perhaps ultimately prove insoluble with the limited data at command, but the general tendency is towards the recognition of a late date.

See further Driver, *Introduction to the Old Testament* (8th ed. 1909), and in the *Century Bible;* H. G. Mitchell in the *Internat. Crit. Comm.;* and the lit. to HOSEA.

Zechstein, a deposit of calcareous rock which covers the Kupferschiefer. It is the equivalent in Thuringia of the fossiliferous limestones of Permian age of the north of England. See PERMIAN SYSTEM.

Zedekiah. See JEWS, p. 331.

Zedlitz, JOSEPH CHRISTIAN VON, poet, born at Johannisberg (then in Austrian Silesia), 28th February 1790, served with distinction in the 1809 campaign at the battles of Regensburg, Aspern, and Wagram. He afterwards entered the service of the Austrian foreign office, and was commissioner in Vienna for Sachsen-Weimar, Oldenburg, and other German states. He died at Vienna, 16th March 1862. His dramas—*Kerker und Krone, Der Stern von Sevilla,* &c.—were long popular; but his name best survives in his lyrics of reflection and narrative—e.g. *Totenkränze* and *Die nächtliche Heerschau*—and in his poetical tales, *Waldfräulein* and *Altnordische Bilder.*

Zedoary (Arab. *Jedwar*), certain species of Curcuma (see TURMERIC), natives of India, China, &c., whose root-stocks (*rhizomes*) are aromatic, bitter, pungent, and tonic, and are used for similar purposes with ginger. They are more used in the East than in Europe. The Round Zedoary of the shops is the produce of *Curcuma Zedoaria,* having palmate root-stocks, straw-coloured within. Long Zedoary is produced by *C. aromatica,* having long palmate root-stocks, yellow within. Zedoary is a powerful sudorific.

Zeebrugge ('Bruges on the Sea'), a name invented for the new port at the end of the canal, 9 miles long, which connects Bruges with the sea close to Heyst, 14 miles north of Ostend. The ship-canal together with the curved mole, built mostly of concrete 1½ mile long and about 100 yards broad, was constructed in 1896–1907. During practically the whole of the World War, Zeebrugge was an important German naval and seaplane base, well fortified, and the British attack under Sir Roger Keyes was planned for 23d April 1918, principally to check German submarine activities in the Channel. A cruiser (*Vindictive*) and two auxiliaries (*Iris, Daffodil*) stormed the seaward end of the mole with landing-parties, and a submarine (*C3*) was blown up to destroy the bridge connecting the mole with the shore. Meanwhile two block-ships (*Intrepid, Iphigenia*) filled with concrete were sunk at the entrance to the canal, a third (*Thetis*) having foundered in the harbour. See WORLD WAR.

Zeehan, a small mining township on the west coast of Tasmania, 29 miles by rail from the port of Strahan on Macquarie Harbour. The name is taken from the adjoining mountain, which Tasman discovered in 1642, and named from the *Zeehaen* ('sea-hen,' cormorant), one of the two ships which formed his expedition. Valuable silver-lead ores were first discovered here in 1884, and zinc is also found.

Zeeland (in English often *Zealand*), a province of the Netherlands, consists of portions of the Flanders mainland (with the town of Terneuzen) and of the islands Walcheren, North Beveland, South Beveland, St Philipsland, Schouwen, Duiveland, and Tholen, with an area of 707 sq. m. and a pop. (1920) of 245,117, about three-fourths Protestants. The provincial capital is Middelburg in Walcheren: Flushing is also in Walcheren. The greatest part of the soil, which is a rich clay, has been redeemed from the sea, which is generally on a higher level, and there are some 300 miles of artificial dykes. Dairy-produce is exported, and linen-weaving and ship-building are carried on. The neighbouring seas abound with fish, and in Schouwen many eggs are collected, myriads of water-fowl resorting thither to form their nests. In 1866 a ship-canal through the island of South Beveland was made to take the place of the Easter Scheldt. From Zeeland came the name of New Zealand (q.v.).

Zeeman, PIETER, Dutch physicist, was born at Zonnemaire near Zierikzee in 1865, studied at Leiden and Strasburg, and in 1900 was appointed professor of physics at Amsterdam. In 1902 he was awarded the Nobel prize for physics.—The ZEEMAN EFFECT is a phenomenon observed by him

in 1896: the spectrum of a source of light is changed if the source is placed in a strong magnetic field, its lines being resolved into several components. See ELECTRON; ELECTRICITY, p. 279; SUN, p. 774.

Zeila. See SOMALI-LAND.

Zeiss, KARL (1816–88), was born at Weimar, started optical workshops at Jena in 1846, and achieved a great reputation for lenses for microscopes. Later, field-glasses, cameras, &c., were made.

Zeist, a large village in the Dutch province of Utrecht, with manufactures of soap, candles, porcelain-stoves, &c. Here settled in 1746 a still thriving society of Moravian Brethren. Pop. 10,000.

Zeitun, a town amidst almost inaccessible crags and gorges 25 miles NW. of Marash in the highlands of south-eastern Anatolia, has iron-mines. The Armenian Christians stoutly maintained themselves for centuries against Turkish oppression. Not till 1878 did the Turks succeed in establishing troops and a fort here; after the Armenian troubles in 1895 the inhabitants secured favourable terms by the intervention of the powers. Pop. about 20,000.

Zeitz, a town of Prussian Saxony, in the government of Merseburg, 23 miles SW. of Leipzig by rail. It lies in a pleasant and fruitful district on the right bank of the White Elster. The town manufactures woollens, cottons, machinery, pianos, &c., and there are brown coalfields in the vicinity. Pop. (1925) 34,561.

Zell (Ger. *Celle*), a town of Prussia, on the navigable Aller, 28 miles by rail NE. of Hanover, with an active trade and considerable manufactures. From the 14th century it was the residence of the dukes of Brunswick-Lüneburg of the Celle line until the extinction of that branch in 1705. The castle is partly late-Gothic and partly Baroque, while the chapel dates from 1485. George III.'s unfortunate sister, Caroline Matilda of Denmark, lived at Zell from 1772 to 1775, and is buried there. For the unhappy Dorothea of Zell see the articles GEORGE I., KÖNIGSMARK. Pop. (1925) 25,456.

Zeller, EDUARD, theologian, and the historian of Greek philosophy, was born at Kleinbottwar in Württemberg, 22d January 1814, studied at Tübingen and Berlin, and settled at Tübingen in 1840 as *privat-docent* in theology. In spite of the strenuous opposition of the more orthodox party he became professor of Theology at Bern in 1847, and at Marburg in 1849, whence he was called to the chair of Philosophy at Heidelberg in 1862, at Berlin in 1872. Perhaps the ablest of the direct disciples of his father-in-law Baur, he forsook theology and his early Hegelianism for the history of philosophy, treated in an impartial and eclectic spirit. He died 25th March 1908.

Of his writings the following are the most important: *Platonische Studien* (1839), *Die Philosophie der Griechen* (3 vols. 1844–52; 4th ed. 5 vols. 1876–81), *Das theologische System Zwinglis* (1853), *Die Apostelgeschichte kritisch untersucht* (1854; Eng. trans. 2 vols. 1875–76), *Vorträge und Abhandlungen* (1865; 2d ed. 1875–77–84), *Staat und Kirche* (1873), *David Friedrich Strauss* (1874), *Geschichte der Deutschen Philosophie seit Leibnitz* (1872), *Friedrich der Grosse als Philosoph* (1886), *Grundriss d. Gesch. d. Griech. Philosophie* (1883; Eng. trans. 1886). His magistral work on Greek philosophy was translated into English in the following divisions: *Socrates and the Socratic Schools* (1868); *Stoics, Epicureans, and Sceptics* (1870); *Plato and the Older Academy* (1876); *The Pre-Socratic Philosophy* (2 vols. 1881); *The Eclectics* (1883); *Aristotle* (1897).

Zemgale. See COURLAND.

Zemun. See SEMLIN.

Zemindar (Persian), under the Mogul emperors of India, the farmer of revenue from land held in common by the cultivators, as responsible for the revenue, who was in many parts of India treated by the English as landlord, giving rise to the Zemindari system (see INDIA, p. 113). The zemindar is now in those regions the actual native proprietor.

Zemstvo. See RUSSIA, *Government.*

Zemzem. See MECCA.

Zenana (Hindustani *zanána* or *janana;* Persian *zanan,* 'women'), the apartments in which Indian women are secluded, corresponding to the *harem* in Arabic-speaking Moslem lands. In India the Mohammedan women are much in the same position as the women in the other less bigoted Mohammedan countries. Amongst those of the Hindu faith the women of all castes are more or less secluded. Especially among the well-to-do and wealthy and in the higher castes the women were strictly confined to the apartments reserved for them—often those looking into an inner quadrangle—and were never to be seen in public. This usage, like many Hindu usages, does not seem to be based on the oldest Hindu scriptures; but it has been very strictly observed till of late, when the influences of European education and zenana missions have, in the larger towns, done much to relieve the monotony of the Hindu women's lives. Till about 1860, when zenana missions were organised in Bengal by Mr Fordyce, Christian women were not allowed to enter a Hindu zenana. Now thousands of Hindu ladies are taught by British, American, and native Christian women, some of whom are completely trained medical missionaries.

Zend, a word meaning 'commentary' (*zend* = *zand,* from the root seen in Sansk. *jñâ,* 'to know'), which is a misnomer of European origin when applied (as seems now inevitable) to the ancient East-Iranian and purely Aryan language, in which the Avesta was long orally preserved and at last written. 'Zend,' or, as it is now usually called, Avestan, is closely related on the one side to the Vedic Sanskrit, and on the other to the Ancient Persian on the Behistun and Persepolis inscriptions. It is distinctly older than the latter, and it in several points represents an earlier stage than even Vedic. Its alphabet was elaborated (probably a thousand years after the composition of the Old Avesta, and for the particular purpose of preserving it) out of the obscurer Pahlavi (Pehlevi) forms, which have been still retained in its translations or commentaries. Pahlavi, the language of the Sassanian period, is not a direct descendant of Ancient Persian, but rests in part at least on another dialect; it is rendered difficult by the use of the most obscure of all characters, and by the presence of some hundreds of logograms which were spoken Aryan but written Semitic, *Malkân Malkâ* ('king of kings') being spoken *Shâhân Shâh.* It has lately been proved that the Avestan character represents inadequately the original sounds, and that the current transcriptions, here followed, are often inaccurate. A knowledge of Pahlavi as well as of the Vedic Sanskrit is essential to the complete criticism of the Avesta.

Zend-Avesta, perhaps the 'commentary and lore'—*zend,* as above; *âvesta* or *âvista* being regular for *âvitta* (*vid*); Pahlavi *Avistâk va Zand*—comprises the ancient sacred writings of the Parsees, which, however, appear in no one MS., and are marked only by their language and general subject as a homogeneous whole. They occupy with their repetitions about a hundred thousand words, although there is good evidence that they were many times more voluminous, twenty-one books like the *Vendîdâd* having once existed and been lost. Like other sacred documents

they include works of widely differing character and age, representing the Zoroastrian religion at several differing stages in its development; they were collected into their present canon under Shahpuhar II. (Shahpur II.; 309–380 A.D.), having also received the attention of the Persian government in the non-Zoroastrian (Arsacid) period under Valkhash, probably Vologeses I., a contemporary of Nero. The *Yasna* (sacrifice-liturgy) is itself a grouping together of important documents surrounding the Gâthâs, which as the only original and historical part, separated from all the other surviving documents, are by centuries the oldest and also otherwise the most important part of the *Yasna* and of the Avesta. The *Vîspered* ('all the lords') seem to have been additions to the several chapters of the *Yasna* (see the *Vendîdâd Sâde*, where they are mostly so written). They celebrate each sacred object as for the moment 'chief of the ritual.' The *Vendîdâd* (*vi-daêvodâtâ*, 'laws established against the Demons'), in 22 chapters, is a priestly code, including a compilation of valuable myths and extensive prescriptions for the exorcism of the Demon of putrefaction, together with more serious laws, while the *Yashts*, in 21 chapters, are mostly invocations addressed to the Yazatas, angels or divinities. The *Nyaishes* are daily praises to the sun, moon, water, fire, &c.; the *Afrîngân* are blessings repeated six times in the year over certain meals in memory of the dead; the *Gâhs* are prayers at the five watches of the day and night; the *Sîrôzah* enumerates the attributes of the spiritual beings who preside over and give names to the thirty days of the month; and then there are later fragments.

A separation of these parts, especially of the two great divisions of Old and New Avesta, is indispensable to all serious consideration of the work, and the very regrettable but wide-spread neglect of such a distinction has simply left the lore of the original Avesta, the Gâthâs, for the most part wholly lost in the nature-worship and superstitions of the later books. In the Old Avesta none of the polytheistic features of the Veda and later Avesta appear. There is no sun-worship, nor moon-worship as noted above, no star-worship, nor Mithra-worship, nor Tishtrya (Sirius)-worship, and no Haoma-worship. There are even no Fravashis (of wholly uncertain meaning, 'pre-existing' 'propagating' being possible), the guardian spirits of the dead (cf. the pitaras and manes) or of invisible and immortal beings. The very attributes of God escape perhaps entirely their later inferior but still sublime dogmatic personification; their personification even when they are invoked may be a higher poetical personification leaving them still the characteristics and not merely the archangels of a Supreme Being. And he is not identified with 'light' as so often stated; nor did he 'create the world by his Word the Honover' (*Ahuna vairya*), which is a later prayer (*Yathâ ahû vairyô*) founded on a line of the Gâthâs. Zoroaster his prophet did not laugh at his own birth (Pliny) nor 'withdraw from the world,' nor 'live on cheese for thirty years,' and out of the heap of this rubbish we must dig that remarkable religion which was not surpassed or equalled by any lore outside of the Semitic Scriptures. It is contained in seventeen precious fragments, making up five Gâthâs (*Yasna*, 28–34; 43–46; 47–50; 51; 53), in Aryan metres like the Vedic Trishṭubh, Gâyatrî, and Âsurî, not more extensive than, say, thirty or forty average Vedic hymns. In these the supreme Deity Ahura Mazdâh, the Living God or 'Lord' (*ahu* = 'the living,' 'life,' or 'spirit,' or perhaps 'Lord'), 'the Wise One' (cf. Sansk. *sumedhâs*), is represented as endowed with and acting through six attributes, *Vohû Manah*, his Good Mind or Benevolence; *Asha* (Vedic *ṛita*) *Vahishta*, his Best Order, the plan and symmetry of his works; his Desirable Sovereign Power, *Khshathra Vairya;* his Holy Perfect-mindedness, *Spenta Aramaiti* (when dwelling in the pious worshipper it is 'complete readiness of mind,' 'devotion,' 'piety'); then his *Haurvatât*, welfare, wholeness; and its abiding character his Immortality, *Ameretât*. These are practically the forms under which he shows himself as the Creator of heaven and earth and of all good things to his faithful worshipper, the thrifty guardian of the herds, which as the source of honest livelihood had already become sacred, and were represented by *Gêush Tashan*, 'Creator of the Ox,' and by *Gêush Urvan*, 'Kine's Soul.'

The saintly citizen was also of necessity a tiller of the earth, which is not superstitiously sacred or worshipped, and an adherent to, or member of, the sacred Cause or Commonweal, more definitively expressed in the Holy Law the *Daêna*, the Insight (of conscience, &c.; cf. *dîn*, root *dî* = *dhî* = 'to see'), by which he exercised his obedience *Sraosha* (not yet the personified angel) in 'caring for the poor.' In which duty he was opposed by the non-agricultural freebooting Daêva(Deva)-worshippers, the *Kavayô*, chiefs who with the *Usijô* and *Karapanô*, its priests and teachers, clung to the unreformed faith, and who were struggling with him for the control of the territory, aided by the Turanians on the north, only a handful of whom became the Friendlies (*Fryâna*) by conversion. These enemies invaded his fields with savage wrath (*Aêshma*), carrying on a warfare which was at once a scene of raid and battle embittered on either side by the divergencies of religious belief. And this in the course of protracted experience brought out into sharper outlines the recognition of one dreadful and self-dependent spiritual power, *Angra Mainyu*—the hostile spirit—who was alone responsible for those sufferings which made Iranian life a load, and who acted through his chief attribute the Plotting Lie (*Druj*), perhaps, but not certainly, already dogmatically personified. He is associated with *Aêshma* (see above) and *Aka Manah*, Evil Mind, insanity, which corresponds antithetically to *Vohû Manah*, although no full six attributes symmetrically corresponding to those of Ahura appear in those portions of the Gâthâs which have survived to us. The *moral idea* is analysed as to thought, word, and deed, and represented as actuating the holy people in their struggle against their powerful and dangerous assailants, little room being left (as in the later Avesta) for anathematising such corruptions as Pride, Scorn, Slander, Envy, the Harlot, the Sorceress. These were however doubtless quite as fully reprobated by the earliest saints. In the last 'turning of the world' the faithful Mazda-worshippers were (together with their less civilised opponents) to undergo a final ordeal. This the faithful successfully meet by passing, encouraged 'by their own conscience,' over the Chinvat, the Judge's (or the Assembler's?) Bridge. This extended toward the Home of Sublimity (or Song) Demâne Garô, which was a Heaven of good thoughts and words and deeds, the scene of God's manifestation as the rewarder. And to this they, the faithful, are welcomed by the souls that have gone before; and there they are to enjoy unending felicity. Whereas the wicked failing to pass the 'narrowed' Bridge (so in the later Zoroastrianism) and 'curst by their own consciences' (so literally) fall to the Abode of the Lie-Demon. There they are met by the souls of the already damned with poisoned food and vile reproaches, and enter a Hell of evil thoughts and words and deeds where they remain for ever, for there is no ground to

ascribe to Zoroaster the conception, later prevalent, of a flood of molten iron which will burn up evil and so purify all evil creatures.

Such is the Gâthic or original Zoroastrian religion. There is one allusion to the very ancient myth of Yima, Vedic Yama. The god Vayu may possibly be mentioned, but the word may be an exclamation. The Fire is already the symbol of holiness, and we have an allusion to an ordeal by means of it. (This later, and not in Gâthic times, degenerated into the full imposture of the Nîrang-i-var, which consisted in pouring molten brass on the breast as a test of innocence.) Beyond these there is little trace of lower elements. 'The wail of the Herd's soul' is poetically represented as articulate, and Zarathushtra is figuratively said to question Ahura; but such features recur in all similar ancient as in modern compositions. The system, if not a pure Unitarianism, is certainly a pure Dualism.

The New Avesta, notwithstanding great difference in the character of its many component parts, may here be treated collectively. In it, while the sublimity maintains itself as throughout, the scene is changed, and the now established religion has paid for its success by the acceptation of doubtfully desirable additions. Ahura is still supreme, save in two foolish passages where he compliments inferior deified objects by joining in the sacrifice to them, which however is by the fact itself shown not to have involved what we call 'worship,' and the bathos is not so decided as in the case of the drunken Indra in the *Rigveda*. God's attributes have become dogmatically personified Archangels with great loss of original meaning. Their names are then given as the Amesha Spenta (Amshaspands), Immortal Holy Ones. Vohû Manah (still later) becomes the representative of the good creation, Asha Vahishta of the fire, Khshathra Vairya of metals (from an accidental occurrence of words); Spenta Ar(a)maiti becomes the earth; Haurvatât represents the waters (rather accidentally than from the healthfulness of waters); Ameretatât represents plants. The Fravashis regularly appear. The Fire receives sacrificial veneration, as do the sun, moon, stars, earth, verdure, waters, &c. Still later six seasons of creation are distinguished, and the five divisions of the day. Sraosha becomes a warrior angel, and the Gâthâs are so ancient that their present number, 'five,' is recognised and mentioned as they are 'worshipped.' Zarathushtra loses all his human traits, and becomes a mythic demigod, conversing literally with Ahura. Laws are given through him, some of them wise and some of them excessively trivial. The Haoma-worship (see SOMA) begins, then Mithra and a throng of gods appear, and the Avesta becomes almost the *Rik*, and with more of its metres. The gods known to the Veda are often, but not always, turned into devils. *Vis à vis* to the Amesha Spenta (see above) appear correspondingly as *six demons* Aka Manah (the Evil Mind), Indra, Sauru (cf. Śarva, a name of Śiva), Nâonhaithya (Ved. Nâsatya), Tauru (cf. Sansk. *tura* = destroying), and Zairika (cf. Sansk. *jaras* = decay), actually grouped, however, with their opposed divinities only in the greatly later Pahlavi *Bundahish*.

The contrast with the Gâthâs cannot be explained as due to the superimposition on an early monotheism of nature and spirit worship. There is every reason to believe that Iranian religion in its earlier stages essentially resembled the nature religion of the Veda, but that a tendency to monotheism gradually developed, in which Ahura Mazdâh came to be accorded a position of supremacy in the pantheon of the Magi, the Iranian priestly class. Zoroastrianism, on this view, is the outcome of the determination of an earnest reformer to purify the conception of Ahura and to render it essentially spiritual and ethical. The attempt inevitably, after the death of its author, failed to maintain itself at its original level, and the Magi, in adopting Zoroastrianism, fitted in much of the old nature and spirit worship. The suggestion that the Magi were non-Aryan priests contradicts the early tradition that Zoroaster was one of them, and lacks all probability.

As to the *birthplace* of the Avesta, we must postulate several different regions for the different works. The privileges of the Zarathushtrian Ragha mentioned in the later Avesta have been supposed to confirm the claims of that province to be the cradle of Gâthic life; but they may have had little to do with it. Airyana Vaêja (the Aryan starting-place) is lost in prehistoric mists. In the *Vendîdâd* we have, although in less original forms, the well-known names of Sughdhâ (Sogdiana), Môuru (Merv), Bâkhdhî (Baktra, Balkh), Harôyu (Harirud), Vehrkâna (Jorjan), Harahvaiti (Harût), Haêtamant (Helmend), Raghâ (Rai), Hapta Hindu (land of seven streams, variously located, possibly including the Punjâb, the land of five rivers); and these according generally with the statements of the later Greeks lead us to look towards the east of Iran, where the Daêva-worshippers must have once lived before some of them became 'Rivermen' (Hindus) by descending into the Punjâb. Keresâspa, an early hero, is located at Kabul, and the name Jemshid still lingers in Eastern Iran. Later the lore may have travelled westward, for Atropatene became a centre; but a religion as like the Avesta as parts of the Avesta are like each other was at home in all Media and Persia under the Achemenids, Arsacids, and Sassanians up to the Arabic conquest in 650 A.D., and a fragment of its adherents still survives at Yezd and Kerman (see PARSEES).

The *age* of the Avesta is still in dispute. Iranian tradition—admittedly very inferior—assigns Zoroaster to 660–583 B.C., and a determined, but implausible, effort has been made to find in him a contemporary of the father of Darius (521–485). The close similarity of the language of the Gâthâs to that of the Veda suggests a date about 1000 B.C., but this is merely conjectural. It is difficult to put these texts later than 700 or 800 B.C.—i.e. two or three centuries before the inscriptions of Persepolis and Behistun, *c.* 500. The language of the inscriptions is in an advanced stage of decay from the earlier inflections; and this, while not decisive, has much weight, for newer language is on the whole more natural to newer writings than older forms. History is on the side of a remoter antiquity, for some of the Greeks placed Zoroaster very long before their time. Moreover, Herodotus' account of the Persian religion and the Magi, with its insistence on their mode of exposing the dead, agrees generally with the later Avesta, suggesting, as the most probable explanation, the theory that by his time Zoroaster had been so long dead that his doctrines had suffered much contamination at their hands. But it is impossible to assert definitely any date for even the older parts of the post-Gâthic Avesta, while its later (genuine) portions extend, say to the 3d century B.C., and easily recognisable additions may be indefinitely later.

The *influence* of the Avesta, or of the ancient lore of which it is a fragment, was possibly extended later to hostile India, where its *dahyus* were reprobated as *dasyus* and its Ahura classed with the now later reprobated Asuras. But Mazdâh-worship, of which the Avesta was the chief exponent, extended over all Iran and Media, as well as Bactria. Angra Mainyu his great adversary is as fiercely represented on the inscriptions of Darius as he is in large portions of the *Vendîdâd*, where Druj, his representative, defiles by impurity, as he does so often on the tablets by the Plotting Lie (Draogha).

The actual name Angra Mainyu does not appear either on the rocks mentioned or in the greater part of the Vendîdâd itself. Even Haurvatât and Ameretât, the great Amshaspands, Weal and Immortality (two of the Seven), are totally absent from one entire third of the Avesta, and this renders the negative argument from the absence of the names from the Inscriptions worthless as proof against the recognised existence of either these Gods or of that Demon at the dates indicated. The Inscriptions are full of the spirit of the Avesta, and either it or a closely related sister-lore influenced the 'Cyrus' of Isaiah, the 'Darius' of Ezra, the 'seven spirits' of Zechariah (cf. also Rev.), &c. The Avesta influenced the Gnostic philosophy in its sources—cf. the *δημιουργὸς εὐνοίας* = Vohû Manah (Plutarch), *ἀλήθεια* = Asha Vahishta (Plutarch), *δημιουργὸς σοφίας* = Aramaiti (Strabo), and the *δημιουργὸς πλούτου* = Haurvatât (Plutarch). It influenced Jacob Boehme (born 1575), and through him Schelling, and even the modern antithetical *Dialektik* and dualism (see Zeller's *Geschichte der deutschen Philosophie*, pp. 14 and 687). For the traditional development among the Indians, see the article PARSEES.

Literature.—Spiegel's Yasna and Vendîdâd texts have also the Pahlavi translation. Geldner's objective edition gives an invaluable mass of variations. For the translations, see the *Sacred Books of the East*, by Darmesteter and Mills (vols. iv. xxiii. and xxxi.); the latter's Gâthâs, with literal and free translations, commentary, and the Zend, Pahlavi, Sanskrit, and Persian texts (Brockhaus, 1892); Darmesteter's Yasna in French (1892); E. G. Browne's *Literary History of Persia* (1903); C. Bartholomæ's trans. (Strasburg, 1905); Moulton's *Early Zoroastrianism* (1913); Dhalla's *Zoroastrian Theology* (1914).

Zengg (Croat. *Senj*), a Yugoslav port on the Croatian part of the Adriatic coast, 75 miles SE. of Trieste, with an old cathedral and some trade. Pop. 3000.

Zenith, a word, like *Nadir*, borrowed from the Arabic, is the name given to that point of the heavens which is exactly overhead—i.e. in line with the spectator's position and the centre of the earth. It is thus the upper pole of the spectator's horizon, as the nadir is the under pole.

Zenjan, a town of Persia, half-way between Tabriz and Teheran, with bazaars and some local and transit trade. Pop. 25,000.

Zeno, a Greek philosopher who flourished about 500 B.C. at Elea, a town of Lucania, in Italy. A favourite disciple of Parmenides, he came with him to Athens, and there the illustrious Pericles was one of his pupils. According to the account usually given, on his return to Elea he joined an unsuccessful conspiracy to deliver his native town from the tyrant Nearchus, and the severest tortures failed to make him betray his accomplices. To ensure his silence he is said even to have bit his tongue off and spat it in the tyrant's face. He held the usual doctrines of the Eleatic school respecting the unity and the immutability of all things, distrust in knowledge acquired through the senses, and reliance on pure reason. He did not deny that there were phenomena or appearances, but he maintained that these were not real existences, in anticipation of Bishop Berkeley. Of his famous four arguments against motion the best known is that of Achilles and the tortoise. But he is chiefly remarkable for having been the first to employ the style of argument known by the name of Dialectics, in which error is refuted, and truth sought to be established, by the *reductio ad absurdum*—a method so skilfully employed afterwards by Socrates and Plato. He devoted his great powers of argument to enforce the doctrines first broached by Xenophanes, and more systematically developed by Parmenides. Of his works only small fragments survive. See Zeller's *Pre-Socratic Philosophy* (Eng. trans. 1881); Russell's *Principles of Mathematics* (i. 1903).

Zeno (342–270 B.C.), founder of the Stoic philosophy, a native of Citium in Cyprus. His father was a merchant, and it is said that some stray writings of the Socratic school he brought with him in his trading voyages made Zeno a philosopher. At two-and-twenty he came to Athens, attaching himself first to the Cynic Crates. But he soon became dissatisfied with the Cynics' conventional disregard for conventionality and indifference to speculative inquiry, and next joined the school of the Megaric Stilpo. Still unsatisfied he betook himself to Polemo the Academician; and having thus made himself master of the tenets of the various schools, he proceeded to open a school for himself in the 'Painted Porch' (*Stoa Poikilē*). Here he taught, honoured by all, until in extreme old age he voluntarily put an end to his life.

See STOICISM; also Zeller, *Stoics, Epicureans, and Sceptics* (Eng. trans. 1870); R. Hirzel, *Untersuchungen zu Cicero's phil. Schriften* (vol. ii. 1882); and A. C. Pearson's *Fragments of Zeno and Cleanthes* (Camb. 1891).

Zeno, EMPEROR. See BYZANTINE EMPIRE.

Zeno OF TARSUS, the successor of Chrysippus, leader of the Stoic school. He expressed himself doubtfully about the doctrine of the conflagration of the world.—ZENO OF SIDON, an Epicurean philosopher, pupil and successor of Apollodorus, taught with great success at Athens down to 78 B.C., and is warmly praised by Diogenes Laertius and Cicero. His fellow disciple and successor Phædrus was heard by Cicero at Rome as early as 90 B.C.

Zenobia, SEPTIMIA, queen of Palmyra, was a native of the city, of Arab descent probably, and became the wife of the Bedouin Septimius Odænathus, who in 264 A.D. was appointed by Gallienus governor of the East. From 266 she and her young son, Wahballath or Uaballathus, shared Odænathus' power, and on his murder (*c.* 270) nearly the whole of the eastern provinces submitted to her sway. When Aurelian assumed the purple, he marched against her with a large army, and, after defeating her in several battles, besieged her in Palmyra. Her hopes of being relieved by the Persians and Arabians being disappointed, she attempted to escape by flight, but was captured, 272. Before the conqueror her courage failed, and she saved her own life by imputing the blame of the war to her counsellors, especially her secretary, the celebrated Longinus (q.v.), who was accordingly beheaded. Zenobia was led in triumphal procession at Rome, decked with splendid jewels, and almost fainting under the weight of gold chains. She was presented by her conqueror with large possessions near Tivoli, where, in the society of her two sons, she passed the rest of her life in comfort and even splendour. She was a woman of great courage, high spirit, and strikingly beautiful. With purity of morals in private life she combined prudence, justice, and liberality in her administration. Her literary acquirements were considerable; she spoke Latin and Greek, as well as the oriental languages, with fluency. Pagan emblems on her coins disprove the notion that she was of Jewish faith. See Wright's *Palmyra and Zenobia* (1895).

Zenta (Serb. *Senta*), a town of Yugoslavia (Hungary till 1918), on the Theiss, 33 miles S. of Szegedin by rail, with an active trade in cattle and agricultural produce; pop. 30,000. Here Prince Eugene defeated the Turks, 11th September 1697.

Zeolite (Gr. *zeō*, 'I boil'), the common name of a large group of minerals, often called the

Zeolitic family. They receive this name from their melting and bubbling up before the blowpipe. They are all soluble in acids, and most of them gelatinise in acids in consequence of silica being set free. They are hydrated silicates of alkalies or alkaline earths, most of them containing alumina. Magnesia is rarely present in them. Their composition, however, is very various. They are generally found in amygdaloidal cavities, or in fissures of basalt, porphyrite, &c., and occasionally also in granite, gneiss, and other crystalline schists and altered rocks, apparently as deposits from water percolating through the rock. They sometimes, but rarely, occur in veins. They are found either in crystals or of crystalline structure, often in plates or fine scales, often in needles or fibrous. Among them are *Analcime*, *Natrolite*, *Scolezite*, *Thomsonite*, *Stilbite*, *Heulandite*, *Phillipsite*, *Gmelinite*, *Chabasite*, *Harmotome* or *Cross-stone*, *Apophyllite*, and *Laumontite*. The number of species and varieties which have been described and have received distinct names is very large.

Zephaniah (Heb. *Sephanyah*—i.e. 'whom Jehovah hides' or 'protects'), a Hebrew prophet who flourished under Josiah towards the end of the 7th century B.C. He is described in his book as a great-great-grandson of Hezekiah; probably the king of that name is intended. From his allusions to prevalent idolatry in Judah and Jerusalem it is inferred that Zephaniah wrote previously to Josiah's great reform in 621 B.C., and that his prophetic work helped to promote that movement. His brief prophecy may be divided into three parts: i., ii. 1—iii. 7, and iii. 8-20. The first, which may be entitled the menace, is an announcement of wide-spread destruction imminent over man and beast, bird and fish, and in particular over Judah and Jerusalem, especially its corrupt court-officials, its merchants, and those who profess religious indifferentism. The 'day of Jehovah' (a day of battle, not of assize) is described in dark and gloomy colours. In the second part, or the admonition, Israel is exhorted to escape by timely repentance from the doom about to overtake the Philistines, Moab and Ammon, Ethiopia and Nineveh. Here the prophet seems to have in his mind the Scythian invasion with which Egypt was threatened in 626 B.C. The promise is contained in the third part. The faithful in Jerusalem are bidden wait patiently for the fulfilment of the divine judgments, after which all nations will serve Jehovah with one consent, and the purified remnant of Israel will rejoice in God's presence among them, and become 'a name and a praise among all the peoples of the earth.'

For the internal problems, see further J. M. P. Smith, *International Crit. Comm.* (with bibliography), and S. A. Cook, *Ency. Brit.*, vol. xxviii. p. 973. See also literature on HOSEA.

Zeppelin, COUNT FERDINAND VON (1838–1917), German inventor, was born at Constance, Baden. Entering the army, he served in the wars of 1866 and 1870, and retired in 1891 with the rank of general to devote himself to the study of aeronautics. By 1900 he had succeeded in building satisfactory airships, named after him, and great progress was made in their construction, especially after 1906 See BALLOONS AND AEROPLANES (*Dirigible Balloons*).

Zerafshan. See BOKHARA.

Zerbst, a town in the state of Anhalt, capital of the former duchy of Anhalt-Zerbst (which became extinct in 1793), on a tributary of the Elbe, 26½ miles SE. of Magdeburg. The castle was built 1681–1750, while the church of St Nicholas is a beautiful specimen of Gothic architecture. There are some manufactures. Pop. (1925) 19,226.

Zermatt, an important centre for tourists and climbers in Switzerland, is a small village near the upper end of the Visp valley in Valais, 25 miles SSW. of Visp by the railway opened in 1891. It stands 5315 feet above the sea, having to the south the great Théodule glacier, above which towers the Breithorn on the east and beyond the Monte Rosa group, and on the west the rocky cone of the Matterhorn (q.v.). The churchyard contains the graves of many of the victims of mountaineering. The Théodule Pass or Matterjoch (10,899 feet) leads to Aosta in Italy. See Whymper, *The Valley of Zermatt and the Matterhorn.*

Zero, the number 0 (see NUMERALS), and the point from which the reckoning begins on Scales (q.v.) such as those of the barometer, &c.

Zetland. See SHETLAND.

Zettinye. See CETINJE.

Zeuglodon (Gr., 'yoke-toothed'), a fossil whale-like mammal, so named by Owen from the yoke-like, double-rooted formation of its cheek teeth. The remains of the Zeuglodon were first found in Louisiana in 1834; an almost complete specimen, 70 feet long, was obtained in 1843 in Alabama. The creature had an elongated snout, and was regarded by Huxley as intermediate between true cetaceans and carnivorous seals. Its remains occur in the older Tertiary deposits of England, Egypt, Australia, and North America.

Zeulenroda, a town of Germany, in Thuringia, 51 miles SSW. of Leipzig, with various manufactures; pop. (1925) 11,047.

Zeus, the greatest of the national deities of Greece, was, according to the most received mythology, son of Kronos and Rhea, born in Crete, either in the cave of Dicte or in that on Mount Ida. With the help of his brothers and sisters, Poseidon, Hades, Hestia, Hera, and Demeter, he overthrew Kronos and the Titans, assumed the sovereignty of the universe, and took as his peculiar province the heaven above, giving to Hades the infernal regions, to Poseidon the sea, the earth being left subject to the influence of all three, although to Zeus belonged the supremacy. Next him stood his sister and consort Hera, mother of Ares, Hephæstus, and Hebe. This was his rightful wife, but her position did not preclude a number of inferior marriages with other goddesses, and intrigues with mortal women, as Europa, Antiope, Callisto, Semele, Danae, Io, Leda, Alcmena, &c. Thus he swallowed his wife Metis to bring forth Athena from his own head; Themis bore him the Hours and the Fates; Eurynome, the Graces; Demeter, Persephone; Mnemosyne, the Muses; Maia, Hermes; Leto, Apollo and Artemis. Crete, Rhodes, Dodona, and Arcadia were the places where the worship of Zeus was most cultivated, but of all places Mount Olympus in Thessaly and Mount Ida in the Troad were his especial haunts. All the local cults of Zeus came gradually to be merged in one great Hellenic divinity—a process carried still further when Zeus was identified with the Jupiter of the Romans and the Ammon of Libya. The original conception of Zeus was certainly pre-Homeric.

Besides the epithets of Zeus from the seats of his worship, he had many titles applied to him from his various powers and functions, moral and physical. He was the father and king of gods and men; the protector of kings, of law and order; the saviour and giver of victory; the avenger of broken oaths and of other offences; he watched over the state, the assembly, the family, over strangers and suppliants; his hand wielded the lightnings and guided the stars; he ordained the changes of the seasons, and, in short, regulated the whole course of nature. All prophecy, too, was supposed to originate in

him, and it was from him that Phœbus Apollo received his oracular gift. He dispensed, as it pleased him, both weal and woe to mortals; but whether he could control the Fates themselves is a point about which the ancients disagreed, as men have done of the Supreme deity in all ages where the problems of free-will and fate cross each other. Of the many epithets applied to Zeus perhaps the best known is the 'Olympian,' from that Olympus in Thessaly whose summit was believed to be his residence as well as that of the other gods. His most celebrated festival was the Olympic, held at Olympia, in Elis, after the end of every fourth year.

These exalted conceptions of the majesty and power of Zeus harmonise indifferently with the stories of his amours with mortals and immortals, as well as with the motives of caprice, anger, deceit freely attributed to him. Solar mythologists explained transformations into a bull and the like as originally a poetic and symbolical realisation of natural phenomena, and the name (Sanskrit *Dyaus*) undoubtedly means *sky*. Greek thought then advanced from the conception of a sky-god to that of a supreme Heavenly Father. Andrew Lang, however, suggested that such a mythological growth as the traditional Zeus is a confusion of myths of perverted history, of primitive physical conceptions, and elementary pantheistic speculation, added to native myths descending from a totemistic stage of culture.

See Animals (Worship of), Jupiter, Mythology; Welcker's *Griechische Götterlehre;* Preller's *Griech. Mythologie;* Overbeck's *Greich. Kunstmythologie;* Farnell's *Cults of the Greek States* (1905–10); A. B. Cook's *Zeus*, a monumental work (1914 *et seq.*); various works by Andrew Lang (q.v.); and the relevant parts of Frazer's *Golden Bough.*

Zeuss, Johann Kaspar, the founder of Celtic philology, was born at Vogtendorf near Kronach in Upper Franconia, 22d July 1806. He studied philology and history at Munich, became professor in the Lyceum at Bamberg in 1847, and died at his birthplace 10th November 1856. His three chief works were *Die Deutschen und die Nachbarstämme* (1837), *Die Herkunft der Bayern von den Markomannen* (1839), and his great masterpiece of erudition and method—*Grammatica Celtica* (2 vols. 1853; 2d ed. by Ebel, 1868–71).

Zeuxippus, one of the eight successors of Ænesidemus in the leadership of the revival of Pyrrhonian Scepticism.

Zeuxis, the celebrated painter, was born at Heraclea, but whether that in Lucania or on the Euxine, is unknown. He is also styled of Ephesus, which means that he belonged to the Ionian school of painters. He flourished from *c.* 420 B.C. to near the end of the century, and was at Athens about the beginning of the Peloponnesian war. He excelled in the treatment of light and shade, in accuracy of imitation of natural objects, and in rendering types of sensuous beauty, especially of women. His most famous pictures were 'Zeus enthroned;' 'Helen,' his masterpiece, painted for the city of Croton; 'The Infant Hercules strangling the Serpents;' 'The Female Hippocentaur.' By the exercise of his art he attained to great riches and fame, and, like his rival Parrhasius, was exceedingly conscious of his pre-eminence. He repeatedly presented rather than sold pictures to cities that were anxious to possess them, because he thought no money-price could pay for them.

Zeyla. See Somali-land.

Zhitomir, or Žytomir, chief town of Volhynia, in Ukraine, on an affluent of the Dnieper, 80 miles W. of Kieff. It is an important commercial and agricultural centre. Pop. 68,000.

Zhob, a river of northern Baluchistan which joins the Gomul north-west of the Suliman Mountains, and with it flows into the Indus near Dera Ismail Khan. There are valuable passes into Afghanistan both by the Gomul and the Zhob valleys—the latter of which was annexed by Britain in 1889.

Zibet. See Civet.

Zidon. See Sidon.

Ziegenbalg, Bartholomew, missionary, was born 14th June 1683 at Pulsnitz in Luzatia, studied at Halle, and on the call of Frederick IV. of Denmark went to establish Christian missions in the then Danish colony of Tranquebar, where he arrived in 1706, dying there in February 1719. He published a Tamil grammar and a Bible in Tamil.

Zierikzee, chief town of the Dutch island of Schouwen (q.v.); pop. 7000. It was taken by the Spaniards in 1576 after an obstinate defence.

Zieten (or Ziethen), Hans Joachim von, Prussian cavalry general, was born at Wustrau in Ruppin, 14th (24th) May 1699, entered the service at fifteen, but retired in 1724, only to rejoin in 1726. A quarrel with his captain brought him a year's imprisonment and dismissal from the service, but in 1730 he was rehabilitated. As colonel of a regiment of hussars (1741) he did much to increase the efficiency of the Prussian light cavalry. In 1744 at the head of the advanced guard he burst into Bohemia, and then executed a dexterous retreat behind the Elbe, in the course of which he beat back an attack of 16,000 men at Moldau-Tein (12th October). He covered himself with glory at Hohenfriedeberg (4th June 1745), and, throughout the Seven Years' War, at Prague, Collin, Leuthen, and Liegnitz, where he was made general of cavalry on the battlefield (15th August 1760). The victory at Torgau (3d November 1760) was in great measure due to his dash and vigour. After the peace 'Old Father Zieten' lived out his days in retirement at Berlin, in especial favour with the king, and died 26th January 1786. See Life by Winter (2 vols. 1885).

Zillertal, a Tirolese valley watered by the Ziller, a tributary of the Inn, whose inhabitants are noted for their handsome figures and their admirable singing. In 1837, 399 of their number, who had adopted Protestantism a few years before, and who were given in 1834 the choice between Roman Catholicism and exile, left their homes, ultimately settling at Erdmannsdorf, near Liegnitz, in Prussian Silesia.

Zimb. See Tsetse.

Zimbabwe, or Great Zimbabye, a notable ruin in Mashonaland, in 20° 16′ 30″ S. lat. and 31° 10′ 10″ E. long., and 3300 feet above sea-level. It is the principal of a series of similar remains along the west side of the Sabi River, and consists of a large elliptical building (280 feet long, with walls 35 feet high and 16 feet thick) on a gentle rise with buildings extending into the valley, and an immensely strong labyrinthine fortress on the opposite hill, 400 feet above. The older buildings are beautiful examples of dry masonry. There are a considerable number of little images of the solar disk; whilst the two conical towers in the sacred enclosure on the lower hill, as well as the chevron ornamentation there, and various objects found in the citadel point to phallic forms of worship. The ruins evidently formed a garrison for the protection of a gold-producing people of the forgotten past, of whose work many traces have been found—a cement smelting-furnace, clay crucibles, a soapstone ingot mould, burnishers, crushers, carved soapstone birds, &c. Mauch found Ophir (q.v.) here, but Keane and subsequent scholars have placed it in Southern

Arabia. The *source* of the wealth of Ophir may be here, however, as it is known that some of the mines in Rhodesia are of great age. Bent assigned the Zimbabwe ruins to pre-Mohammedan Arabians (with possibly Phœnician influences), as the art indicated is foreign to the African races. Hall maintained their antiquity and Asiatic origin. MacIver held they are by Africans, and not older than the 14th or 15th century.

See Bent, *Ruined Cities of Mashonaland* (1892); Keane, *Gold of Ophir* (1901); Hall and Neal, *Ruins of Rhodesia* (1902); Hall, *Zimbabwe* (1905), and *Prehistoric Rhodesia* (1909); MacIver, *Mediæval Rhodesia* (1906).

Zimisces. See BYZANTINE EMPIRE.

Zimme. See SHANS.

Zimmermann, JOHANN GEORG, RITTER VON, philosophical writer, was born at Brugg in the canton of Aargau, 8th December 1728, studied medicine at Göttingen, and by his dissertation, *De Irritabilitate* (1751), laid the foundation of his fame. After a tour through Holland and France, he became town-physician at Brugg, and here he published his famous book *On Solitude*, a work of artificial melancholy and sentiment, which had a vogue now somewhat difficult to understand, and was translated into almost every European language (*Ueber die Einsamkeit*, 1755; entirely new ed. 4 vols. 1784–85). Other works were *Vom Nationalstolz* (1758), and *Von der Erfahrung in der Arzneikunst* (2 vols. 1764). From 1768 he lived at Hanover as physician to George III. of England and Hanover, and was summoned to Berlin to the last illness of Frederick the Great, and after the king's death published several vain and worthless books about him. He died 7th October 1795. See the book by Bodemann (Hanover (1878).

Zimony, Magyar name of Semlin (q.v.).

Zinc (sym. Zn, at. no. 30, at. wt. 65·37, sp. gr. 6·9 to 7·15) is for many purposes a valuable metal. Some coins struck by the Romans early in the Christian era are of brass (an alloy of copper and zinc), but as zinc was not then known as a separate metal, it is believed that this brass had been produced by adding to melted copper the mineral calamine. Paracelsus (q.v.) pointed out that zinc was a metal; but the exact nature of this metal and of its ores was not distinctly known till the 18th century. But zinc appears to have been used in China, and perhaps also in India, from an early period. In early times it was known and sold under the name *Spialter*, whence the modern word *Spelter*, widely applied to crude zinc or 'slab zinc.'

Zinc is a bluish-white metal, breaking with a crystalline fracture. When chemically pure it is malleable and ductile at ordinary temperatures, but all commercial zinc is somewhat brittle until it is raised to the temperature of 212° F. or preferably to 300° F. (149° C.), when it can be hammered, drawn, or bent. It is rather remarkable that it does not readily become again brittle when cooled, although workmen manipulating zinc out of doors in winter generally take the precaution to heat it previously over a fire. If zinc is raised to a temperature as high as 400° F. it becomes so brittle that it can easily be reduced to powder. The melting-point of this metal is 773° F. (412° C.), and its boiling-point is 1904° F. (1040° C.). It burns in the air at a high red heat with a bright, greenish-white flame, emitting dense white fumes. It is only slightly acted on by air and moisture, but when exposed to these it rapidly loses its bright metallic lustre, taking on a thin grayish film which protects the metal beneath from the further action of oxygen and carbonic acid. Pure zinc is only very slowly attacked by mineral acids, but all commercial kinds dissolve in them very readily with evolution of hydrogen. Ordinary zinc will also dissolve in a warm solution of potash or soda. A slight crackling sound is produced when the metal is bent after fusion, and even with sheet-zinc prepared for use this sound is sometimes detected by artisans shaping it, in which case they anneal the piece before sharply bending it. Zinc, though much harder than lead or tin, is softer than ordinary brass.

Oxide of Zinc, ZnO.—When the finely-divided metal is held in the flame of a Bunsen burner it takes fire, giving off abundance of white fumes which are of zinc oxide. These fumes were called philosopher's wool by the alchemists. On a large scale oxide of zinc is manufactured by burning the vapour of the metal. There are two commercial processes. In the older, called the *French* or *indirect* process, the oxide is made by vaporising the metal in clay retorts and burning the vapour; in the newer *American* or *direct* process it is made from the ore, the zinc being reduced from the ore, vaporised and oxidised in the same furnace. The French process produces an extremely white, bright, and fine product. 'Direct' oxide is not so white though almost as fine. Zinc oxide, or 'zinc white,' has many applications in the arts, but its two principal uses are for white paint and for rubber tyres and other rubber goods, and together these consume 90 per cent. of the production. Among minor users of the oxide are manufacturers of insulated wire, celluloid, glazes, American cloth, artificial ivory, glues, dental cements, false teeth, and zinc ointment. As a paint it has the advantage over the lead pigment of not darkening with age, though possessing less density and 'body' than white lead. Oxide of zinc is readily soluble in acids, forming colourless salts. Heated in a flame it shows a yellow colour which turns white on cooling—a characteristic test for the metal. *Lithopone* is a white pigment used on a large scale. Though invented in Britain, the best qualities come from Holland. It is prepared from zinc ore, barytes, and sulphuric acid. *Zinc hydroxide*, $Zn(HO)_2$, is thrown down as a bulky white precipitate from solutions of zinc salts by potash or soda, avoiding excess of alkali. It dries to a white powder.

Zinc Sulphate, $ZnSO_4,7H_2O$.—This salt, which, as shown by the formula, crystallises with seven molecules of water, used to be known as white vitriol. It crystallises in four-sided rhombic prisms isomorphous with Epsom salts, and, as sold, has usually the same appearance. It dissolves readily in water, and has a nauseous metallic taste. Sulphate of zinc is obtained when hydrogen is prepared by the action of sulphuric acid on zinc, but is made in larger quantities by roasting the native sulphide of zinc (blende) at a low red heat in the air until the necessary oxygen is absorbed. The product is thrown into water while hot, giving a solution from which the crystals are deposited. Sulphate of zinc so obtained is purified from arsenic and some other metals by treating its acidified solution with sulphuretted hydrogen. Iron and manganese have to be separated from the filtered solution by sodium hypochlorite. The salt is used in calico-printing, in making varnishes, and in medicine.

Zinc Carbonate, $ZnCO_3$, is one of the chief ores of the metal. The artificial basic carbonates are produced by precipitation from the solution of a zinc salt with an alkaline carbonate. When a boiling solution of sodium carbonate has the purified solution of zinc sulphate slowly added to it, a basic carbonate of zinc separates, which is then washed and dried. This gives the pure oxide on being heated.

Zinc Chloride, $ZnCl_2$, formerly known as *Butter of Zinc*, is formed by heating the metal in chlorine gas. But it is usually obtained by dissolving

zinc or its oxide in hydrochloric acid, and evaporating the solution to dryness, fusing the residue, and casting it into cakes. When thus prepared it contains some oxychloride. It is grayish white, waxy, and extremely hygroscopic. It is very soluble in water, for which it has a great affinity; it deprives some organic bodies of water, and is caustic, disinfectant, and antiseptic (see BURNETT'S DISINFECTING FLUID).

ORES.—Blende and Calamine are the two principal ores of zinc. Those of minor importance are Zincite, Franklinite (q.v.), and Hemimorphite.

Blende, Sphalerite, Black Jack, or Sulphide of Zinc, contains when pure 67 per cent. of zinc and 33 of sulphur, but like most ores it usually contains impurities. It crystallises in the tetrahedron section of the cubic system. The crystals are generally of a beautiful black colour, and present considerable variety in their forms.

Calamine, or Carbonate of Zinc.—By some mineralogists this mineral is called *Smithsonite*, a name more usually given to the silicate of zinc. It crystallises in the rhombohedral system, and contains when pure 52 per cent. of zinc. Calamine is generally found in calcareous rocks, and is usually of a dull yellow or reddish-brown colour in the ordinary massive state. Owing to impurities of earthy matters and oxide of iron, its percentage of zinc is sometimes as low as from 15 to 20. Calamine and blende are frequently associated.

Hemimorphite, Electric Calamine, Silicate of Zinc.—The composition of this mineral when pure is zinc oxide 67·5 (zinc 54), silica 25·0, water 7·5. It crystallises in the orthorhombic system, and its crystals are strongly pyro-electric. Its colour, always delicate, has many shades, such as white, blue, green, brown, yellow, red, and gray. Hemimorphite is found along with other zinc or lead minerals in Carinthia, Westphalia, near Aix-la-Chapelle; sparingly at Matlock and elsewhere in England, and more plentifully at one or two places in the United States, notably near Selinsgrove on the Susquehanna, and in Wythe county, Virginia. It is a valuable ore.

Occurrence and Production.—Zinc is almost unique among non-ferrous metals in that it is produced extensively in countries other than those from which the ore is obtained. Thus, both Belgium and Great Britain are important producers, the former being outranked only by the United States; but all the zinc smelting in Belgium, and almost all that in Britain, is carried out on imported ore. The British zinc industry depends chiefly on Australian ore. The principal countries yielding zinc ore are the United States, Australia, Germany, and Poland. The United States furnishes about half the world's supply of the metal. By far the most important zinc mining region in the States is the Joplin district which extends into three states, namely, Kansas, Oklahoma, and Missouri. The Joplin deposits are of zinc blende, lying as lenticular (lens-shaped) masses in limestone. Australia owes its high position as a zinc producer to the great Broken Hill mines, which lie near the western boundary of New South Wales, and which yield lead and silver as well as zinc. Formerly, much of the zinc ore (blende and calamine) at Broken Hill was thrown away with the waste products (*tailings*) owing to exceptional difficulty in extracting it. The change has been brought about by the introduction of the *flotation process* of ore-dressing, in which gas bubbles (which are found to adhere to fine particles of the metallic sulphides, but not to particles of waste) are used as the means of lifting and floating off the sulphides in a bath of water. The zinciferous tailings of Broken Hill are being re-worked on a large scale by this process and both zinc and lead obtained from them. The more recent development of *selective flotation*, by which the various minerals of an ore can be floated one by one (galena first; blende second, for example) has much improved the recovery, and is employed on zinc ores to an enormous extent in many parts of the world. Another method of separating blende from galena is by *magnetic separation*—a process depending on the fact that, owing to ferruginous impurity, zinc blende is slightly magnetic and can be drawn away from its associates in a strong magnetic field. Poland and Germany share Upper Silesia, the biggest zinc field in Europe. Both blende and calamine are obtained there, the latter near the surface and the former at greater depths. These ores, associated with lead ores, occur in beds (see MINING) in limestone, and, like those of Joplin, are held to have replaced limestone long subsequent to the deposition of the latter rock (*metasomatic replacement*). In British Columbia, Canada has a zinc field of great and rapidly-growing importance, and Rhodesia is also a considerable producer. Italy, China, Tunis, and Algeria yield a good deal of zinc ore.

Owing to a variety of causes, such as exhaustion of known deposits, low state of the market, and high price of labour, the output of zinc from British mines has steadily declined. In 1905 the United Kingdom produced 23,909 tons of zinc ore, valued at £139,806; in 1909 the output had fallen to 9902 tons; it showed a temporary revival in 1913, when 15,419 tons were got; for 1922 the production was only 1620 tons; while, during 1925, 1603 tons of zinc ore were marketed, the average percentage of metal in the product being 46 and the selling value £11,826. Though the British industry is under a cloud, zinc is widely distributed in the country. Zinc ores, principally blende, have been worked or are being worked in the counties of Cornwall, Devon, Somerset, Shropshire, Derbyshire, Westmorland, Cumberland, Yorkshire, Durham, Northumberland, Anglesey, Cardigan, Carnarvon, Denbigh, Flint, Montgomery, Dumfries, Lanarkshire, and the Isle of Man. The ore, generally associated with galena and barytes, and, in Cornwall, with copper minerals, nearly always occurs in veins (see MINING). Not infrequently the upper part of a vein yields galena, and the lower part blende. Calamine is not a common mineral in Britain, though small quantities of it may occur in the oxidised part of a vein (the *gossan*) which lies just below the surface. The only area which has yielded calamine in bulk is the Mendip Hills, Somersetshire, an extremely ancient mining district, where calamine occurs as a cementing-material in dolomitic conglomerate. The world's annual production of zinc is about one million tons.

SMELTING.—Until recently, almost the whole of the world's zinc was obtained by the *distillation method*, which takes advantage of the volatility of the metal at a bright red heat, and the bulk of the supply is still obtained in that manner; but of late years there have been important developments of *electrothermic smelting*, of certain *wet processes*, and particularly of the *electrolytic method* of extraction.

The *distillation process* involves two distinct operations: in the first the zinc compounds in the ore are converted into oxide; in the second the oxide is reduced to the metal by means of carbon at a temperature above the boiling-point of zinc, so that the reduced metal passes off from the retorts as a vapour which is then condensed. If the ore is calamine (carbonate) the preliminary conversion to oxide is carried out by calcination (heating without air); if it be blende the ore is roasted (heated with air), the sulphur is expelled as sulphur dioxide, and zinc oxide (ZnO) remains.

A large variety of roasting furnaces of the reverberatory type are employed in which the charge is agitated mechanically or by hand. The sulphurous fumes from the roasting blende are sometimes used for the manufacture of sulphuric acid. The reduction and distillation of the metal is carried out in closed fireclay retorts to which condensers are attached, the retorts being heated to 1200° or 1400° C. Three types of retort furnace are used—the Belgian (fig. 1), the Silesian (fig. 2), and the Rhenish, which may be said to be a modification of the two former. The Rhenish furnace is the favourite today. Belgian retorts are circular or elliptical in section, about 8 in. across, and 4 or 4½ feet in length. As fig. 1 indicates, they are arranged in a furnace in from 2 to 7 rows or tiers, each tier containing 6 to 8 retorts. Silesian and Rhenish retorts are larger, each being about 5½ feet long. The Silesian furnace has either one or two tiers or retorts, and the Rhenish two or three. Unlike fig. 1, the latter are usually double furnaces, there being an equal number of retorts projecting into the combustion chamber from each side. Some of the largest modern furnaces have 1000 retorts or even more. Coal-firing is becoming obsolete for zinc distillation furnaces. Gas firing is commoner,

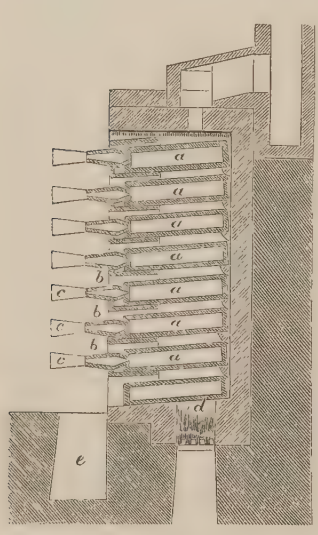


Fig. 1.—Vertical Section of a Belgian Furnace.

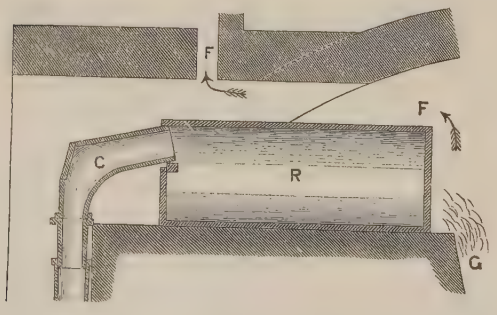


Fig. 2.—Longitudinal Section of a Retort or Muffle (R) of a Silesian Furnace: C, condensing portion; G, fireplace; F, flue, which also passes along the sides.

the gas being either natural gas (America) or obtained from producers. To the mouth of each retort is luted a fireclay nozzle or condenser in which most of the volatilised zinc condenses, and over the condenser's mouth a sheet-iron tube or 'prolong' is fitted to collect the 'fume.' The retorts are charged with a finely-divided mixture of roasted ore, with about 40 per cent. of its weight of coal, the latter supplying the carbon required in the reaction. A charge takes about twenty-four hours to work off. The zinc dust collected is cast into slabs (spelter).

Electrothermic smelting of zinc ore was introduced by de Laval in Scandinavia about 1904. The heat is produced by an electric current, and the ore, mixed with carbon, is caused to traverse the heated zinc, with the result that zinc is reduced and volatilised. The method is, however, only attractive where electric power is cheap and plentiful, the consumption being about 12,000 k.w. hours per ton of metal. The electrolytic process also requires plenty of cheap electric power to be a commercial success. Of late years important developments have taken place in it, especially in regions where there are hydro-electric power stations. The Vieille Montagne Zinc Company (headquarters at Liége, Belgium), the largest and oldest existing European zinc concern, is producing electrolytic zinc at a big plant at Viviez, France. In the electrolytic process the ore is generally calcined to render the zinc amenable to solution by some solvent—usually sulphuric acid—and the metal is obtained from the liquor in electrolytic cells.

Zinc is obtained in an almost pure state by redistillation in clay retorts, if the first portion which comes over is rejected. But if required quite pure the oxide purified as above described under *zinc carbonate* must be reduced by pure carbon, such as charcoal from sugar.

Until it became known early in the 19th century that raising zinc to the temperature of 300° F. or somewhat less rendered it fit to be worked by machine tools the metal was used for little else than to make Brass (q.v.). It is still very largely employed to produce this and other alloys, but zinc itself is now extensively manufactured into many different objects. Among these may be mentioned sheets and other forms for roofing purposes, baths, plates for engraving upon, light screens with open patterns, and numerous kinds of stamped ornaments and articles of utility. In Paris and elsewhere it is largely used for the cheaper kinds of 'bronze' statuettes and like decorative objects, as it can be easily darkened to imitate bronze (see BRONZING). One of the most important applications of zinc is in galvanising iron to protect it from rusting, especially in such cases as roofing sheets, tanks, and telegraph wires. Zinc has not a good reputation as a structural material other than for covering purposes.

Zincali, a name used in Spain for the Gypsies (q.v.).

Zincography. See ILLUSTRATION OF BOOKS.

Zinc Ointment (*Unguentum Zinci*) is composed of 15 parts zinc oxide and 85 parts benzoated lard, and is used as a mild astringent for inflammatory diseases of the skin.

Zinder, a sultanate and town in French Sudan, just north of Kano province; a fertile and populous district, growing Guinea corn, millet, tobacco, cotton, and indigo. Pop. of town, 6000.

Zingari, a name used in Italy for the Gypsies (q.v.).

Zingel (*Aspro zingel*), a fish of the perch family, found in the Danube.

Zingerle, IGNAZ VINCENZ (1825–81), born at Meran, became a Benedictine monk, and then professor of German at Innsbruck. He wrote on Tirol, its myths, folk-tales, and customs; books on ethnography; and some volumes of poetry.

Zingiberaceæ, a family of monocotyledons, including among other genera Zingiber (see GINGER), Costus (q.v.), and Alpinia. They are with few exceptions tropical perennial herbs, terrestrial or epiphytic; with thickened rootstock and cone-shaped inflorescence.

Zinoviev, GRIGORY EVSEEVICH, Russian politician, was born in 1883 at Elisavetgrad, Ukraine, studied chemistry and law at Bern University, and in 1903 first associated himself with Lenin in the work of Bolshevik propaganda. He was from 1917 to 1926, when he lost power, one of the principal figures in the Soviet government, being appointed president of the Communist International in 1919. During the general election of October 1924 in Britain, an incendiary letter addressed to the British Communist Party, signed to appearance by Zinoviev (and two others), but disclaimed by him, and never of definitely proved or disproved authenticity (the original was not produced), became public (in doubtful circumstances), with important political results; the Labour government was decisively defeated at the polls, and the Anglo-Russian treaties signed by it (8th August 1924), but not ratified, were repudiated (21st November 1924) by its Conservative successor.

Zinzars, one of the names for the Kutzo-Vlachs (q.v.).

Zinzendorf, NICOLAUS LUDWIG, COUNT OF, (1700–60), the refounder of the church of the Moravians (q.v.), was born at Dresden, and studied under Francke (q.v.). He received the persecuted Moravians on his Lusatian estate, was ordained at Tübingen, was exiled for a time for his religious innovations, but was ultimately held in great esteem, and died as bishop of the Moravian brethren, at Herrnhut. He wrote hymns and sermons.

See Lives by Bovet (in Fr. 1860: Eng. trans. 1896), Becker (1886), Römer (1900), the two last being in German. Bauer and Burkhardt published an edition of his hymns (1900).

Zion. See JERUSALEM.

Zionism. Zionism is the movement for the restoration or resettlement of the Jews in Palestine. It may be said to date from the destruction of the Jewish state by the Romans in 70 A.D. and to have manifested itself not only in the Jewish liturgy in its repeated prayers for the restoration of the Jews to the Holy Land, but still more definitely in the several pseudo-messianic movements with which the pages of post-biblical Jewish history are strewn, the main object of which in every case was the return of the Jews to Palestine. Once or twice in the past nineteen hundred years foundations were laid on a lower plane than that of messianism for the rebuilding of a Jewish state or national entity. Such an attempt was that of Don Joseph Nasi (d. 1519) in the 16th century, who, with the encouragement and assistance of Sultan Sulaiman, undertook the rebuilding of the city of Tiberias on the Sea of Galilee and the development of the surrounding district as the nucleus of a self-governing Jewish community. But the experiment was not pressed, or the obstacles in its way were insuperable, and the effort came to nought. The development of Palestine as a Jewish centre took a different form many years afterwards in the 19th century when first Sir Moses Montefiore (1784–1885) turned his energies and his influence in the direction of bettering the conditions of the Jews in the Holy Land and of directing their attention to agricultural pursuits, and later Baron Edmond de Rothschild (b. 1845) undertook agricultural settlement both of native born and immigrant Jews on a large scale, and by the expenditure of a large fortune and unlimited sympathy laid the foundations of the present Jewish settlement. Before the advent of Baron Edmond, Jews in Palestine engaged in agriculture were few and far between. For the first years after he had turned his interest in that direction every Jew settled on the land may be said to have owed his place there directly to the baron's generous and sympathetic assistance and guidance. The road opened out by him has since been followed by others, but Baron Edmond has earned and is willingly and gratefully granted the title of the Father of Jewish Colonisation in Palestine.

Simultaneously with this practical movement there arose a literary movement in the direction of a general interest in Palestine as the centre of Jewry, and in Hebrew as the language of the Jewish people. This movement was almost if not entirely confined to the Russian empire in whose lands about half of the Jews of the world dwelt, and dwelt for the most part in conditions of oppression and misery, an eager soil for an idealist revival.

Judah Alkalai (d. 1878), Moses Hess (1812–75), Hirsch Kalischer (1795–1874), Leo Pinsker (1821–1891), Perez Smolenskin (1842–85), and Asher Ginzberg (*Ahad Ha'am*) (1856–1927), were the pioneers in this idealistic movement. It materialised also in the *Choveve Zion*, or Lovers of Zion, a Russian society for the colonisation of Palestine by Jews, which to some extent supplemented the work of Baron Edmond de Rothschild and was supplied with its human material by the outburst of militant anti-semitism in Russia and Rumania in 1881 and 1882.

Although Zionism is as old as the Diaspora and has ever been as widespread as the Jewish liturgy, Zionism in the modern sense, the Zionism of which the International Zionist Organisation is the representative and that of which the non-Jewish world has cognisance, dates at the earliest from 1895, when Theodor Herzl (1860–1904), a Viennese journalist resident in Paris, and a Jew, assimilated almost to the verge of non-Jewishness, moved by the evidences of active anti-semitism of which he had been a witness in Paris and Vienna, proposed the creation of a Jewish state as the solution of the universal, and apparently otherwise insoluble, Jewish problem. In his first conception there was no connection between his idea and Palestine, but he quickly realised that without the impetus of the Jewish masses there was no hope of the realisation of his plan, and that Palestine was the only country that could arouse in the Jews as a people the fire of enthusiasm, an essential to his success. Herzl first published his proposals in *Der Judenstaat*. He had hoped to secure the support and adhesion of all classes of Jewry, and from the richer classes to draw the material means of bringing his scheme to fruition. But in this he was quickly disappointed, and soon found that although he could draw a considerable following from the Jewish masses in eastern Europe, outside of them and that region he had but a handful of supporters. His seclusion from the main currents of Jewish thought and his environment by the nationalist-imperialist atmosphere of Vienna and Paris combined to give all of his ideas a political tinge. His predecessors and contemporaries from further east pictured to themselves more a spiritual home for Judaism and Jewry. To Herzl a Jewish political state was the ideal. Thus with the advent of Herzl and his movement the settlement of Jews in Palestine fell into the background, and the securing of political safeguards for the Jewish self-governing community took its place. The creation of a chartered company on the lines of one of the British colonial chartered companies was the policy he placed before himself and his followers, and the remaining few years of his life were spent in fruitless embassies to the Sultan and other rulers and statesmen in the vain hope of securing the charter he desired from the ruler of Turkey and of Palestine.

In the meanwhile, in 1897, an organisation, the Zionist Organisation, was formed. It arose out of the firt Zionist congress held at Basel, convened

by Herzl, and intended to be representative of world Jewry, although few delegates came from elsewhere than eastern Europe and the communities of east European origin, and of names known to the world hardly a single one was to be found there. The programme of the new organisation was formulated in the following terms: 'Zionism strives to create for the Jewish people a home in Palestine secured by public law. The Congress contemplates the following means to the attainment of this end: (1) The promotion on suitable lines of the colonisation of Palestine by Jewish agricultural and industrial workers; (2) the organisation and binding together of the whole of Jewry by means of appropriate institutions, local and international, in accordance with the laws of each country; (3) the strengthening and fostering of Jewish national sentiment and consciousness; (4) preparatory steps towards obtaining government consent, where necessary, to the attainment of the aim of Zionism.'

If the efforts of Herzl and his organisation to obtain the much desired charter or other concession from the Sultan had no result, they were more successful in another little less important direction. The movement had attracted the sympathetic attention of the British government, from whom the suggestion came that Jewish settlements should be formed in the Sinai Peninsula, that is to say, Egyptian Palestine, a territory under British protection. The proposal was given careful consideration, but found impracticable, and the Government then offered a large tract of territory in British East Africa for the same purpose. This offer was submitted to the Zionist Congress of 1903 and immediately threatened to split the organisation from top to bottom. The Zionists who were Zionists from devotion to Jewry's ancient heritage would have nothing of it. To them the dream of Palestine meant far more than the reality of East Africa. The other party who were Zionists more for the promise offered by the movement of the relief of Jewish distress in the Diaspora, seeing otherwise little hope of the attainment of their ends in their lifetimes, looked optimistically to the British government and its offer. The former class consisted of men who looked forward, even if they did not expect to settle in Palestine themselves, who were permitted to have neither a country nor a home in the lands of their birth: the latter were the vicarious Zionists, those who looked on Zionism as a scheme for settling other Jews in Palestine or some other land. A decision was postponed to the Congress in the following year when the proposal was politely rejected. In the meanwhile, Herzl, worn out by his efforts, had died at the age of forty-four years. One immediate consequence of the rejection was the secession of a large party of the opposition, mainly western Jews, under the leadership of Israel Zangwill (1864–1926), who formed the Jewish Territorial Organisation for the establishment of a Jewish self-governing community without geographical limitations. This organisation had little practical effect and predeceased its founder by several years. The Zionist Organisation, meanwhile, with the death of Herzl, sank into practical insignificance.

The outbreak of the war with Turkey in 1914, however, gave the movement new life. The first consequence of the hostilities before the Ottoman empire was involved had been apparently still further to depress the fortunes of the organisation, for with one half of Europe pitched against the other in a death struggle, an international organisation, if it survived, ran the certain risk of being attacked by both sides. Thus the Zionist Organisation had necessarily to suspend its operations. The entry of Turkey into the war, however, brought the fate of Palestine into practical politics. This was obvious to both Dr Chaim Weizmann (b. 1874), a Manchester Jewish chemist, and a few prominent members of the British Cabinet, in addition to others of less importance. Dr Weizmann got into contact with Mr Lloyd George and Mr (later Sir) Herbert Samuel, both members of the Cabinet, and was soon joined by Mr Nahum Sokolow (b. 1859), one of the Russian members of the Zionist executive. Dr Weizmann and Mr Sokolow with a few other Zionist residents in England became in effect the executive of the Zionist Organisation, and as such negotiated with three successive British governments, until in November 1917 the government, through its foreign secretary, Mr A. J. (afterwards Earl) Balfour, gave its formal support to the Zionist policy as formulated in the Balfour Declaration: 'His Majesty's government view with favour the establishment in Palestine of a national home for the Jewish people, and will use their best endeavours to facilitate the achievement of this object, it being clearly understood that nothing shall be done which may prejudice the civil and religious rights of non-Jewish communities in Palestine, or the rights and political status enjoyed by Jews in any other country.' This declaration was affirmed by the governments of the other principal Allied Powers, and was incorporated in the mandate for Palestine, which to the practically unanimous joy of Jews throughout the world, was entrusted to Great Britain. The first British High Commissioner, i.e. Governor of Palestine, was Sir Herbert Samuel, an English-Jewish statesman of the front rank and of strong Zionist sympathies.

The Zionist Organisation consists of a Congress which meets every second year and is elected by all Jewish adults who contribute a shekel (a shilling) per annum. The Congress elects a general council, a relatively large body which meets two or three times a year to consider questions of Zionist policy, and an executive, with whom the government of the organisation in the intervals between the Congresses practically rests. Of this executive those members who reside in Palestine not only represent the Zionist Organisation in its negotiations with the Government of Palestine, but also in effect represent the Jewish population of Palestine in its relations with that Government. They have also much internal administrative work in the spheres of settlement, education, health, &c. The Zionist Organisation derives its funds entirely from the voluntary contributions of Jews in all parts of the world. The revenue from the shekel, supplemented by specially earmarked contributions, meets the administrative expenses of the Organisation itself. For its expenditure in Palestine on immigration, colonisation, education, health services, &c., it is dependent on the *Keren Hayesod*, or Foundation Fund. The Jewish National Fund limits its function to the purchase of land and its preparation for settlement. This land it holds in perpetuity as the inalienable property of the Jewish people, leasing it, however, to Jewish tenants on perpetual leases. The total annual revenue from the three funds amounts on the average to a little less than a million pounds. The president of the Zionist Organisation is Dr Chaim Weizmann.

There are three main schools of thought in the Zionist movement. Political Zionism aims at the creation of a Jewish political state in Palestine. Herzl, Max Nordau (1849–1923), and Zangwill were its main representatives; but long before the death of Nordau its impracticability, not to mention its inexpediency, was patent to almost everyone. At the Zionist Congress of 1925 the advocates of this policy, the Revisionist Zionists, numbered a handful, and in 1927 Dr Weizmann's programme

was endorsed by the majority of delegates. The Cultural Zionists, those whose aim is to recreate in Palestine the centre of the Jewish civilisation, drew their inspiration in later years from *Ahad Ha'am*. Their influence in the organisation is considerable, and the rehabilitation of Hebrew as the one language of the Jews of Palestine may be accounted largely to them. The overwhelming majority of present-day Zionists are practical Zionists, those whose aim it is to settle as many Jews as quickly as possible in Palestine on a self-supporting basis. If they succeed, they hold, both political and cultural Zionism can look after themselves.

BIBLIOGRAPHY.—The literature of Zionism is very voluminous and is to be found in all European languages as well as Hebrew and Yiddish. A short and practicable bibliography would consist of the writings of Hess, Kalischer, and the other authors mentioned in the foregoing, and the publications, including the records of the several Congresses, of the Zionist Organisation, the *Keren Hayesod*, and the Jewish National Fund, and the annual reports of the Government of Palestine. Books in English of a more general claim are: Richard Gottheil, *Zionism* (Philadelphia, 1914); H. Sacher (editor), *Zionism and the Jewish Future* (London, 1916); A. M. Hyamson, *Palestine—The Rebirth of an Ancient People* (London, 1917); Simon and Stein (editors), *Awakening Palestine* (London, 1923); and Leonard Stein, *Zionism* (London, 1925).

Zips or SZEPES, formerly a northern county of Hungary, now part of Slovakia. The people are Slovaks, Germans, Ruthenians, and Magyars.

Zircon, a mineral composed of silica (32·8 per cent.) and zirconium (67·2 per cent.), but containing sometimes a little iron. It crystallises in square prisms often with pyramidal terminations. The hardness is 7·5, and the specific gravity is 4·7. The mineral is sometimes colourless, but more often coloured in shades of yellow, green, and brown. It has adamantine lustre. It occurs as an accessory constituent of most igneous rocks, but is especially common in rocks of the granite and syenite families. On account of its resistance to weathering it also occurs frequently in derivative rocks. Transparent varieties are of value as gems, e.g. Jacinth (q.v.), which is orange, red, or brown, and jargon or jargoon, which is whitish to smoky in colour.

Zirconium (Zr.; atom. number 40; atom. wt. 90·6) is the metallic constituent of the earth *zirconia*, which is found in association with silica in the mineral *zircon* in Brazil, Ceylon, the Urals, and Norway. Berzelius obtained it in 1824 from zirconia, which is now used for incandescent gas-mantles and for furnaces. The metal is used in alloy steels.

Zirknitz, a lake in Carniola, Yugoslavia, is 20 miles SW. of Laibach and 1860 feet above sea-level. Its area and depth depend much on the rainfall; the tunnels and cavities in the limestone mountains around adding to it or carrying off its waters according to the weather. It is sometimes 5 miles long, but in some years its whole area is dried up.

Ziska, or ZIZKA, JOHN, born of noble family at Trocznov, in Bohemia, about 1370, and brought up as page to King Wenceslas, fought against the Teutonic knights (q.v.) at Tannenberg (1410) and distinguished himself at Agincourt (1415) against the French. Returning to Bohemia soon after the murder of John Huss (q.v.), he became chamberlain to King Wenceslas, and joined the extremest party of hatred against Rome. After the outbreak at Prague (30th July 1419) Ziska was unanimously chosen leader of the popular party, and the first great religious conflict of Germany began. Wenceslas dying, his brother, the faithless Emperor Sigismund, sent 40,000 men into the country to obtain the throne, but the Hussites defeated his army with a hastily levied force of but 4000 men. Ziska quickly completed his conquest of Bohemia by capturing the castle of Prague (1421), and secured his hold of the country by the erection of fortresses, chief of which was that of Tabor, whence his party derived its name of *Taborites*. Ziska armed his followers with small firearms then little used, and made up for his lack of cavalry by the protection of the *Wagenburg*, or 'cart-fort,' constructed of the baggage-wagons. In 1421 he lost his remaining eye at the siege of the castle of Raby, but though now totally blind he continued to lead on his troops to a succession of twelve victories almost unexampled in history. Indeed his one defeat (Kremsier in Moravia) was almost a drawn battle. The victory of 18th January 1422, when Sigismund's second invading army was driven in headlong rout into Moravia, and 2000 drowned in attempting to escape across the frozen Iglau, was his greatest battle; and next year at Aussig he overthrew the German army, commanded by Frederick the Warlike of Saxony and the Elector of Brandenburg. Sigismund, now convinced that to conquer Bohemia was impossible, offered the Hussites full religious liberty. But the war-worn old soldier did not live long enough to complete the treaty, for at the siege of Przibislav he was seized with the plague, and carried off, 12th October 1424. He was buried in a church at Časlav, and his iron war-club was hung up over his tomb. An apocryphal but characteristic story was long told that by Ziska's express command his skin was tanned and made into a cover for a drum, that even when dead he might be a terror to his enemies.

See HUSS, the study by Tomek (1882), and Count Lutzow's *Bohemia* (1896).

Zither, a flat stringed musical instrument, having a wooden frame and flat sounding-board, five melody-strings tuned in fifths with frets, and from twenty-seven to forty-two strings used for accompaniment. It is placed on a table or on the knees; the melody-strings are stopped with the left hand, while all the strings are played by the right hand, the thumb being armed with a metallic *plectrum* to bring out the melody more prominently. Its tone is clear, keen, and melodious, but tiresome. It was fashionable in England in the eighteen-eighties, and is to be frequently found in Austria at the present day. The name of the Greek *kithara*, a different instrument, was arbitrarily bestowed upon it.

Zittau, a town of Saxony, on the Mandau, near its junction with the Neisse, is an important railway centre, 21 miles SSE. of Löbau and 21 SSW. of Görlitz. The chief buildings are the church of St John (1834–37) and the Rathaus (1840–45). In a district rich in lignite, it is the centre of the linen and damask industry of Saxony, and has manufactures of woollens and iron foundries. Pop. (1925) 38,521.

Zittel, KARL ALFRED VON (1839–1904), born at Bahlingen in Baden, became professor at Munich in 1866, and wrote a standard handbook of *Palæontology* (5 vols. 1876–93; Eng. trans., ed. Eastman, 2 vols. 1900–02), and a history of geology and palæontology.

Zizania, CANADA RICE, or WILD RICE. See RICE.

Zizel, or SUSLIK (*Spermophilus citillus*), a European ground squirrel, type of a genus mainly American. See SQUIRREL, CHIPMUNK.

Zizyphus. See JUJUBE.

Zlatoust, a town of the Ural Area of Russia, on the navigable Ai, 198 miles NE. of Ufa by the great Siberian railway (1890). It is the centre of a mining region, and has iron-foundries; pop. 21,000.

Zmeinogorsk, a town of Siberia, 350 miles SW. of Tomsk. In the neighbourhood is one of the most productive silver-mines in Siberia. Pop. 12,000.

Znaim (Czech *Znojmo*), a town of Moravia, Czechoslovakia, on the Thaya, 63 miles by rail N. by W. of Vienna, with a Romanesque castle-chapel (12th cent.) and earthenware manufactures. Here Marmont and Masséna defeated the rear-guard of the Archduke Charles, 11th July 1809. Pop. (1921) 21,197.

Zoan. See TANIS.

Zoantharia. See ACTINOZOA.

Zoar. (1) In Biblical geography a city, known also as BELA, of Palestine. According to the Old Testament tradition it was one of the 'cities of the plain,' but was spared at Lot's intercession as a refuge for him. See SODOM AND GOMORRAH.—(2) A village of Ohio, on the Tuscarawas River and Ohio Canal, 91 miles S. of Cleveland. The place originated in a communist society founded in 1819 by some four hundred German emigrants, persecuted Christian dissenters from Württemberg. The society flourished under its original leader Joseph Michael Bäumeler, called Bimmeler (1778–1853), but after his death declined, and in 1898 was dissolved. Latterly it had ceased to be purely communistic, resembling rather a business company in which each member held an equal number of shares. See E. O. Randall, *History of the Zoar Society* (Columbus, 1899).

Zöckler, OTTO (1833–1906), was born at Grünberg in Hesse, became professor of theology at Giessen and from 1866 at Greifswald. He edited the *Evangelische Kirchenzeitung* (from 1882) and other religious serials.

Among his books are a history of asceticism (1863), and of apologetics (1907), a book on the Augsburg Confession (1870), several sections of Lange's *Bibelwerk* (1866–72), *Das Kreuz Christi* (1875; Eng. trans. 1877), *Theologie und Naturwissenschaft* (2 vols. 1877–79), and *Gottes Zeugen im Reiche der Natur* (2 vols. 1881; Eng. trans. 1886). He edited, and partly wrote, the well-known *Handbuch der theologischen Wissenschaften in encyklopädischer Darstellung* (3 vols. 1883–84; 3d ed. 4 vols. 1889–90), and, together with Strack, a *Kurzgefasster Kommentar* to Old and New Testaments and the Apocrypha (1886–1905).

Zodiac (Gr. *zōdiakos*, commonly derived from *zōon*, 'an animal'), the name given by the ancients to an imaginary band extending round the celestial sphere, having as its middle line the ecliptic or apparent path of the sun. It was fixed at about 16° in width, for the purpose of comprehending the paths of the sun and of the five planets (Mercury, Venus, Mars, Jupiter, and Saturn) which were then known; and as of these planets Mercury has by far the greatest inclination of orbit to the ecliptic, and the value of that element in his case is only 7° 0′ 9″, the width given to the zodiac was amply sufficient for the required purpose. Many minor planets have greater inclinations to the ecliptic, and at times are outside the zodiacal limits. The stars in the zodiac were grouped into twelve constellations, to each of which 30° or $\frac{1}{12}$th of the whole circle was assigned, though it often did not fill up that space, but was only situated in it; and this equable division into *signs* was of great advantage in defining the positions of the sun and planets at any epoch.

The constellations, with the appropriate symbols of the corresponding signs, are as follows: Aries (*Ram*) ♈; Taurus (*Bull*) ♉; Gemini (*Twins*) ♊; Cancer (*Crab*) ♋; Leo (*Lion*) ♌; Virgo (*Virgin*) ♍; Libra (*Balance*) ♎; Scorpio (*Scorpion*) ♏; Sagittarius (*Archer*) ♐; Capricornus (*Goat*) ♑; Aquarius (*Water-bearer*) ♒; Pisces (*Fishes*) ♓. As one half of the ecliptic is to the north, and the other to the south of the equator, the line of intersection of their planes is a diameter of each, and the two points in which this line meets the celestial sphere are known as the equinoctial points. The comparative immobility, with respect to the ecliptic, of these points suggested at once the employment of one or other of them as a point from which to reckon, and accordingly that point at which the sun crosses the equinoctial from south to north was fixed upon, and called the first point (or commencement) of Aries. After the sun had advanced eastward through this sign—i.e. 30° along the ecliptic—he entered the sign of Taurus, continuing his course onward through the others in the order in which they are given above, again crossing the equinoctial southwards at the point where he emerged from Virgo and entered Libra. This was the case with the sun during the time of Hipparchus (q.v.); but though the equinoctial points move very slowly, yet they do so continuously, and the westerly motion of 50″ annually which they have along the ecliptic has at the present time separated the sign Aries from the constellation Aries, and caused the former to correspond almost to the constellation Pisces. This gradual retrogression of the signs through the constellations of the zodiac will continue till they accomplish, in about 25,868 years, a complete circuit; after which period the sign and constellation of Aries will coincide, as they did in the time of Hipparchus. Neither the zodiac nor its constellations are of much use now in astronomy, except as, like the other constellations, affording an easy though somewhat fantastic nomenclature for the stars, and a rude but sometimes convenient mode of reference to their positions.

Zodiacal Light is the name given to a faint patch of light seen after sunset or before sunrise on nights when there is no moon. In low latitudes it is visible at all seasons of the year, but rarely in Great Britain, except in the spring in the evenings, and in the autumn in the early mornings. It is so called because the part of the sky thus illuminated lies in or near the zodiac. The light is reflected sunlight from small particles of matter surrounding the sun in a flat lenticular form, nearly coinciding with the plane of the sun's equator, and extending to a distance greater than the earth, since its apex is often seen at distances greater than 90° from the sun. It was first distinctly pointed out by Cassini, and was for a time regarded as an atmosphere of the sun. From the fact that the light is polarised it was inferred that it was largely reflected sunlight. This was confirmed by an observation that its spectrum (necessarily with very small dispersion) was like that of the sun. The small particles which reflect the sunlight in this manner circulate round the sun in independent orbits, and are similar to the particles forming the rings of Saturn. They are very widely separated from one another, as is evident by the faintness of the light and the fact that their total mass is small or they would produce perturbations in the movements of planets and offer resistance to the passage of comets.

Zoë (*c.* 978–1050), Byzantine empress, daughter of Constantine VIII. See BYZANTINE EMPIRE; also C. Diehl, *Byzantine Portraits* (trans. from French, 1927).

Zoea. See CRUSTACEA.

Zoega, JOHANN GEORG, archæologist and Coptic scholar, was born in Jutland, 20th December 1755, studied at Göttingen, and finally settled at Rome, where he turned Catholic. He wrote on Egyptian coins and Roman bas-reliefs, and made a great catalogue of Coptic MSS. He died 10th February 1809. See Life by Welcker (1819).

Zoepffel, Richard Otto, a theologian of the school of Ritschl, was born at Arensburg in Livonia, 14th June 1843, taught theology at Göttingen, but settled in 1872 at Strasburg, where he became ordinary professor in 1877, and died 7th January 1891. His books are *Die Papstwahlen* (1871) and *Johannes Sturm* (1887). In conjunction with Holtzmann he edited the *Lexikon für Theologie und Kirchenwesen* (1882; 2d ed. 1888–91).

Zoetrope (Gr. *zōē*, 'life,' and *tropos*, 'a turning'), a scientific toy by which several pictures of objects or persons in various positions are combined into one visual impression, so as to give the appearance of movement or life. It consists of a hollow cylinder, closed at the lower end, supported on a vertical axis in the centre of that end. Round the interior of the cylinder, in its lower part, is a band of pictures of the same object, but varied in succession according to the varied steps of the movement intended to be shown. Round the upper part is a series of narrow slits, equal in number and opposite to the pictures. On revolving the cylinder rapidly and looking through these slits as they pass the eye, the figures of the picture appear as one moving figure. Each picture impresses the eye but for a moment, and is blended with the real picture by the continuance of the retinal sensation in the eye. Thus all become apparently successive positions of the *same* figure. The Kinetoscope and Kinematograph are developments. See Edison; Kinematograph.

Zoffany, John (1725–1810), German portrait-painter, born at Frankfort-on-the-Main, studied art in Rome, and in 1758 settled in London, but lived in Florence 1772–79, and in India 1783–90. He was an original R.A. (1769). See Life by Lady Manners and Dr G. C. Williamson (1920).

Zohar. See Cabbala.

Zoilus, a Greek rhetorician, who flourished in the 3d century B.C., and was born at Amphipolis. From the bitterness with which he attacked Homer he was surnamed *Homeromastix* ('Homer's Scourge'), and has bequeathed his name proverbially for a malignant critic.

Zoisite, a hydrated silicate of aluminium and calcium, crystallising in the orthorhombic system; a rock-forming mineral belonging to the epidote group, occurring in some crystalline schists such as amphibolite and as an alteration-product of the felspars of gabbros. A rose-red Norwegian variety is called thulite.

Zola, Émile, French novelist, was not a Frenchman by extraction, his father having been an Italian engineer, who, however, executed works in France. The son was born in Paris on 2d April 1840, but passed most of his early life in Provence, returning to the capital for his school education. His father had died when he was a small boy, and when he left school he entered the publishing house of Hachette as a clerk. He became an active journalist pretty early, and engaged not merely in fiction, but in criticism both of art and literature. Here he was almost uniformly unfortunate—indeed the rather silly title, *Mes Haines* ('My Hates'), under which his chief critical articles were later reprinted, showed his weakness. Like other journalists, he had to deal with politics, and was not much more fortunate here; while later he attempted the drama with equal lack of success. The truth is that Zola, for good or for ill, was a novelist born: and after early beginning his immense work in this department he by degrees confined himself to it. It is not a little noteworthy that among his earliest work figure the charming *Contes à Ninon*, collected and published when he was four-and-twenty, which have none of the faults of his later and larger works, and have sometimes been thought, not always by the least competent critics, to show him at his very best. This faculty for short stories showed itself again and again in *Nouveaux Contes à Ninon*, published ten years later (1874), in the collections, entitled from their chief tales *Le Capitaine Burle* (1883) and *Naïs Micoulin* (1884), and most of all in the splendid *Attaque du Moulin*, the first piece of a collection of stories by himself and his chief disciples entitled *Les Soirées de Médan* (Zola's country house), and published in the year 1880. Long before this latter date, however, the author had become one of the most prominent and contested figures in the French literature of his day. In the later years of the Second Empire he had formed with Flaubert, Daudet, the Goncourts, and the Russian novelist Turgeniev a sort of informal society, which discussed all things literary, and which tended in the persons of its younger members to form what is called the Naturalist school—a name of which, in contradistinction to 'Realist,' Zola claimed the copyright. Among other works he published in 1867 a book, *Thérèse Raquin*, in which again others have seen his greatest work, and which certainly is a very powerful and remarkable picture of the effects of remorse.

But it was not until after the Franco-German war that, in imitation to a certain extent of Balzac, he began the great series of novels generally called *Les Rougon-Macquart*. Every year or two he was wont to make an addition to this series, which ultimately contained, with branches and complements, a score or so of volumes, not proceeding in strict chronological order, but all connected by the appearance, more or less, of the same or different members of the family. This singular collection of books is, in the strictest sense, a collection of novels with a purpose—or with several purposes. The two 'mother-ideas' of Zola's 'Comédie Naturaliste' (or as some would unkindly say, 'Comédie Bestiale') were essentially the idea of heredity and the idea of a certain cerebral infirmity, which determines in different ways the fate of individuals. But in working this theory into practice Zola imported a notable difference. It was his intention to apply it in the widest manner to the study of the *document humain*—the records real or supposed of actual lives—and in order to do this he took the most extraordinary pains to master the technical details of most professions, occupations, and crafts, together with the history of recent and actual events in France. He began (1871) with a sort of general sketch and introduction called *La Fortune des Rougon*, and then he diverged into specialist paths. *La Curée* and *Son Excellence Eugène Rougon* dealt, or were supposed by the author to deal, with the society and official life of the later days of the Second Empire. *La Faute de l'Abbé Mouret* attacked the life of the country clergy and the results of celibacy, and, like *La Conquête de Plassans*, a vivid study of provincial life, had some special admirers. *Le Ventre de Paris* busied itself with the lowest, or almost the lowest, strata of the Parisian population, the life-history of the *halles* or markets—a theme which was later and somewhat differently treated in the most famous of the author's earlier works, *L'Assommoir*, a book specially depicting the vice of drunkenness; in *Pot-Bouille*, which dealt with the lower *bourgeoisie* and their servants; in *Au Bonheur des Dames*, which handled shops. *Une Page d'Amour* (much affected by some) and *La Joie de Vivre* (not successful as a whole, but very powerful in parts) were more generally and ambitiously human. *Nana*, 'the success of scandal' of the whole, was devoted exclusively to the cult of that great goddess, Lubricity, of whom

we have all heard, and who certainly has her followers in France and elsewhere. *L'Œuvre*, the opening of which, at least, obtained praise from critics not very fond of him, dealt with art and literature. *La Terre* (the beastliest of the whole, unless that proud pre-eminence be allotted to *Germinal*, which dealt with mining) was consecrated to the French peasant. *La Bête Humaine* contains much minute information as to the working of railways; *Le Rêve* displayed a remarkable acquaintance with the details of church ritual; *L'Argent* exploited financial crashes; and *La Débâcle* grappled with the great disaster of 1870. *Dr Pascal* (1893) is 'a story of the emotions'; *Lourdes* (1894), dealing with faith-healing, *Rome* (1896), a study of the Papal court, and *Paris* (1898) form a trilogy. *Fécondité*, 'the gospel of population,' was a work of 1899; *Vérité*, violently anti-clerical, was translated in 1903; *Justice* was to have formed one of the same series. In 1897 Zola took up with disinterested courage the cause of Dreyfus (q.v.), impeached the military methods, declared the trial unfair and the result a scandal. He was tried and (on a second trial) condemned, but escaped to England, and returned after the decision of the Cour de Cassation in 1899 for a revision of the first Dreyfus trial. On 29th September 1902 he succumbed to the fumes of a defective stove. In 1908 his remains were transferred to the Panthéon, although opinion upon his merits as an author was by no means unanimous. For it was pointed out that he confined his attention to sides of human nature which, though admittedly existent, are intermittent and exceptional; that where he attempted other sides, as in *Le Rêve*, he was more conventional and unreal than the *clair-de-lune* sentimentalist; and that he had no notion or grasp of human nature as a whole. He was repeatedly, but unsuccessfully, a candidate for a chair in the Academy.

Most of Zola's books have been translated into English by Vizetelly and others. See Studies by Sherard (1893), Macdonald (1899), and Lives by Vizetelly (1904), Lepelletier (1908), Seillière (1923), the two last being in French.

Zollikofer, Georg Joachim, a famous pulpit orator, born at Sankt Gallen in Switzerland, 5th August 1730, became preacher at Murten in 1754, at Leipzig in 1758, and died there, 25th January 1788. His sermons fill fifteen volumes (1789–1804), and he produced a hymn-book. See the studies by Garve (1788) and Claudius (1783).

Zöllner, Johann Karl Friedrich (1834–82), born in Berlin, became 1872 professor of Physical Astronomy at Leipzig, made important observations and theories on comets, the solar constitution, and the thermal and photometric conditions of planets. He wrote on those subjects, on the electro-dynamic theory of matter, and on spiritualism.

Zöllner, Karl Friedrich (1800–60), born at Mittelhausen in Thuringia, taught music at Leipzig and at Dorpat, and conducted at Cologne, New York, and Leipzig. He composed several operas (including *Frithiof*), musical comedies, cantatas, choral works, and an oratorio (*Luther*).

Zollverein (Ger., 'customs-union'), a union of the German states, under the leadership of Prussia, so as to enable them in their commercial relations with other countries to act as one state. When, after the war of liberation in 1815, the political union, destroyed by the downfall of the Holy Roman Empire, had been restored to a certain degree in the German Confederation (see Germany, Vol. V. p. 188), internal commerce was felt to be trammelled and depressed by the collection of revenue at the frontiers of every petty state; and united action in regard to foreign commerce was impossible. The first suggestion of such a customs-union came from Prussia; but it took many years before an actual beginning was made, and still longer before it reached its ultimate extent, as the plan was opposed for a long time by the jealousies and special interests of many of the states. In 1834 eighteen states had entered a union for a term of eight years; in 1835–38 five more, in 1842–52 other five, including Baden, Brunswick, Frankfort, and Hanover. During the term 1854–65 all the German states were members except Austria, the two Mecklenburgs, and the Hanse towns. The events of the Austro-Prussian war disarranged the union. In 1867 a new customs-union was established between the North German Confederation and Bavaria, Württemberg, Baden, and Hesse. But all such arrangements were rendered almost superfluous in 1871 by the constitution of the German empire, though the grand-duchy of Luxemburg was included until the Treaty of Versailles, and elsewhere the boundaries of Reich and Zollverein were not exactly coincident.

Zomba, in the highlands of the Shiré (q.v.), seat of the government of the Nyasaland Protectorate. See Nyasa.

Zombor (Serb. *Sombor*), an old town of the Bačka, acquired after the Great War by the Serb-Croat-Slovene State from Hungary, stands near the Franzen Canal and the Theiss, 26 m. NE. of Essek (Osijek). There is some trade in cereals and cattle. Pop. (1921) 31,332.

Zonaras, Joannes, a historian who flourished at Constantinople in the 12th century, was private secretary to Alexius I. Comnenus, and spent the last years of his life in the monastery of St Elijah at Mount Athos. His *Chronicon* is a poor compilation giving the history of the world from the creation to the death of Alexius in 1118, but is important in the use made of the now lost work of Dion Cassius (q.v.). It was edited by Dindorf (6 vols. 1868–75). Zonaras wrote also an important commentary on the canons and decrees of the oriental councils, ecumenical and other, from those of the apostles to the 'Photian synods' of 861 and 879, a compendium of oriental church law.

Zoö-geography, the study of the geographical distribution of animals. See Geographical Distribution.

Zooglœa. See Bacteria.

Zooid. See Polyp.

Zoological Gardens, London, familiarly known as the 'Zoo,' a large piece of ground on the north side of Regent's Park, containing one of the finest collections of wild animals in the world. The gardens were opened in 1826 by the Zoological Society of London, which had been founded two years previously. There were about two hundred exhibits, as contrasted with over five thousand to-day. In 1831 the king presented the Royal Menagerie, which had been housed at the Tower, and this was but one of the early events in a long succession of gifts which have led to a very remarkable array. In the days of small things, when Sir Stamford Raffles was president, there were outsiders who scoffed at the 'Noah's Ark Society,' but we read that 1,823,613 persons passed into the ark in 1925. There have been great steps of progress, such as the erection of special houses for insects, for reptiles, for monkeys, and so on; the designing of spacious aviaries for birds; the use of ponds and terraces; the securing of greater freedom and fresh air; and so on down to the utilisation of ultra-violet light. The animals have become healthier and happier, and show more in the way of habits. The two most recent developments are the fine aquarium and the acquisition of a large

annex in the open country. The 'Zoo' occupies a high place among similar gardens, such as the Bronx Park of New York, to mention one of the largest, and the Zoological Park of Edinburgh, to mention one of the smallest and most beautiful.

Zoology, the science of animal life, included along with Botany within the science of Biology. What has been said in the article Biology (q.v.) in regard to the place which the study of organisms occupies among other departments of knowledge, and in regard to the general evolution of the science, is entirely relevant in regard to zoology and need not be repeated here.

Departments of Zoological Study: (a) *Morphological.*—When we study the forms of animal life, or analyse these into their parts—e.g. organs, tissues, and cells; or arrange similar forms in groups—e.g. species, genus, family, order, and class, we are considering morphological or statical relations, the organism's actual life being left out of account. Anatomy and histology (or minute anatomy), the results of classification or taxonomy, so much of embryology as is occupied with the description of form and structure at successive stages in life-history, and of palæontology as is concerned with the structure of extinct animals must all be included under morphological zoology.

(b) *Physiological.*—When we study the habits of an animal; or analyse its activity into the functions of its parts—e.g. organs, tissues, and cells; or investigate the chemical changes of the living matter itself; or consider the life of the animal as one of a pair, family, or herd, or in its complex inter-relations with the associated fauna and flora, we are investigating dynamic or physiological relations. What is often popularly called 'natural history,' or, more technically, 'bionomics,' is concerned with the 'higher physiology' of animals, that is to say, with their life as intact individualities and as active parts of the complex systems of things which we call nature.

(c) *Historical.*—When we inquire into the fauna characteristic of successive geological ages and endeavour to trace the history of a class, order, or the like; or when we turn our attention to the development of individual animals, and seek to work out their life-history, we are pursuing studies technically described as palæontological and embryological respectively, but agreeing in this that they are both historical or 'genealogical.'

(d) *Ætiological.*—Finally, when we inquire into the conditions of organic change and progress, and endeavour to interpret either individual development (ontogeny) or racial history (phylogeny), our studies are ætiological. As a matter of fact these departments of zoology, though logically distinct, cannot be satisfactorily pursued apart from one another, and all the greater steps of zoological progress have been made by workers who combined the various inquiries. Of such all-round zoological work the best illustration is Charles Darwin.

History.—The rudiments of zoology must be looked for in the ancient lore of the hunter, the fisherman, the shepherd, and the breeder, and much may also be gathered from researches into the history of words, art, and religious customs, but the science first took definite shape in the mind of Aristotle (384–322 B.C.). He seems to have known over 500 animals, and describes the structure and habits of some of these; he laid the foundations of comparative anatomy and taxonomy, and with remarkable insight discerned not a few important generalisations, such as the homology of organs. But the foundations which Aristotle so firmly laid remained for more than fifteen centuries almost unbuilt on, for Pliny (79 A.D.) was little more than an uncritical collector of current information, and Galen (200 A.D.), who dissected monkeys, was rather a human anatomist than a zoologist. It is true, however, that in various countries, and at various times onwards to the Renaissance, there were restless inquisitive spirits who were neither discouraged by the general lack of interest nor silenced by the frowns of the church. Many of these, however, were wont to cloak their zoological enthusiasm in mystical guise, and it is thus that we must interpret many of the allegorical works of mediæval times. Fact and fiction were strangely jumbled; credulity and superstition ran riot along the paths of science; and the long persistence of the *Physiologus* (see BESTIARY), with its series of fifty fanciful emblems, is typical of the prevalent mood of the dark ages.

The quickening of civilisation brought about by the Crusades, the discovery of new lands by travellers like Marco Polo and Columbus, the founding of universities and learned societies, the establishment of museums and botanic gardens, the invention of printing, the appearance of Aristotle's works in translation and dilution, and many other practical, emotional, and intellectual movements gave fresh force to science, as indeed to the whole life of man. Among the results of this scientific renaissance were the labours of the 'Encyclopædists'—such as the Englishman Edward Wotton (1492–1555), who wrote a treatise, *De Differentiis Animalium;* the Swiss Conrad Gesner (1516–65), author of a *Historia Animalium;* the Italian Aldrovandi (1522–1605); and John Johnston or Jonstonus (1603–75), a Polish Scot, the author of a dozen Latin folios on natural history. By their industry a large mass of facts was accumulated, but of too many it must be said that their intellectual appetite was greater than their powers of digestion, and the progress of science was in quantity more than in quality. About the middle of the 18th century the best aims of the 'Encyclopædists' were realised in Buffon's *Histoire Naturelle* (15 vols. 1749–67), a work which in spite of its wide range—for the author took all nature for his province—was full of acute perceptions and useful suggestions.

Instead of following further the chronological development of the science, it will be convenient to notice the great workers in the different departments.

I. *Morphological.*—In the hands of John Ray and Carl Linnæus the results of their own industry and the accumulations handed down from the Encyclopædists began to take the form of a definite taxonomy. The classification which may be inferred from Aristotle's works, and which persisted down to the time of Wotton and even afterwards, gave place to Linné's *Systema Naturæ* (1st ed. 1735; 12th, 1768), in which six classes were recognised—Mammalia, Aves, Amphibia, Pisces, Insecta, and Vermes. Lamarck drew the distinction between Vertebrates and Invertebrates with greater firmness than heretofore, and distinguished 'apathetic' animals (Infusoria, Polypi, Radiaria, Tunicata, Vermes), 'sensitive' animals (Insecta, Arachnida, Crustacea, Annelida, Cirripedia, Conchifera, and Mollusca), and 'intelligent' Vertebrata (Fishes, Reptiles, Birds, and Mammals). He was a firm believer in a *scala naturæ*, a regular series of increasing structural complexity, and though this was illusory he did much towards reducing the chaos in which he found Invertebrate animals. Cuvier, in his *Règne Animal* (1829), elaborated the idea of four great types or *embranchements*—Vertebrata, Mollusca, Articulata, and Radiata. This rapidly gave way before more careful anatomical analysis, as may be inferred from the early classifications of R. Leuckart, H. Milne-Edwards, and T. H. Huxley, which in turn were destined to be superseded as embryological and palæontological

research came to the aid of anatomy, and as taxonomy began to be profoundly influenced by evolutionary conceptions.

Among those who have prosecuted the anatomical analysis of the animal body, revealing those homologies on which a sound comparative anatomy is based, Cuvier stands foremost. Meckel, Johannes Müller, Leuckart, Gegenbaur, and Dohrn among Germans; Milne-Edwards and Lacaze-Duthiers in France; Owen, Huxley, and Ray Lankester in England may be cited as representative of comparative anatomists. The analysis of organs into tissues which Bichât worked out in his *Anatomie Générale* has been followed out in great detail by zoologists, Leydig's *Histologie des Menschen und der Thiere* (Frankfurt, 1857) being a conspicuous example. The microscopic study of organisms which had been in progress since the days of Malpighi (1628–94), Swammerdam (1637–80), Hook (1635–1702), and especially Leeuwenhoek (1632–1723), led beyond tissues to the component cells, and in 1838–39 Schwann and Schleiden formulated their *Zellenlehre*, the elaboration and correction of which has been the chief task of modern comparative histologists (see CELL, EMBRYOLOGY, PROTOPLASM). This ultimate morphological analysis which leads to the study of the living matter itself has been aided by the perfecting of the Microscope (q.v.), and by the elaboration of histological technique—fixing, staining, imbedding, and microtome section-cutting.

II. *Physiological.*—If we disregard a few pioneers and isolated observations, such as Harvey's discovery of the circulation of the blood, we may associate Albrecht von Haller (1708–77) and John Hunter (1728–93) as the founders of physiology. They began to do for the functions of organs what Cuvier did for structure. Among the many illustrious zoologists who have continued their labours Johannes Müller (1801–58) is prominent.

Parallel to the morphological analysis from organ to cell was the gradual deepening of physiological study. Bichât's penetration beneath the functions of organs to the properties of tissues; the physiological study of cells by Schwann, Max Schultze, and many others; the experimental work of Claude Bernard, and his appreciation of the essential similarities of function in plants and animals, lead gradually to the modern study of protoplasmic metabolism (see PROTOPLASM), and to such inquiries as those of Krukenberg on the comparative physiology of animals or those of Metschnikoff on the functions of leucocytes.

III. (a) *Embryological.*—The study of individual development is the youngest department of zoological study, for although Harvey in 1651 sought to establish the fundamental fact *ovum est primordium commune omnibus animalibus*, and the true conception that organs arose by new formation (*epigenesis*) and not from the unfolding of some invisible preformation, the efforts of his prophetic genius were in great part futile, and the doctrines of the 'preformationists' persisted. Nor did immediate progress follow even when Wolff in 1759 ably reasserted Harvey's doctrine of epigenesis, for it was not till 1817 that Pander took up embryological work virtually where Wolff had left it. In fact it is from the work of Von Baer (1792–1876) that we must date the foundation of modern embryology, of which one of the most illustrious representatives was F. M. Balfour (see EMBRYOLOGY).

(b) *Palæontological.*—Although Leonardo da Vinci, Palissy, and others had discerned the true nature of fossils as remains of ancient life, and Woodward (1665–1722) had begun to collect and understand some of these, we need not hesitate to call Cuvier the founder of palæontology. To the fragmentary remains of the extinct he applied with signal success the principle of the 'correlation of parts,' and he was the first to begin that welding of palæontological and anatomical facts which has yielded such important results. Among continuators of his work have been Owen and Huxley in Britain, Kowalevsky in Russia, Abel in Austria, Zittel in Germany, Gaudry in France, Marsh and Cope, Osborn and Lull in America.

IV. *Ætiological.*—Apart from the philosophical speculations of Greek philosophers, a few ætiological suggestions found in the works of Aristotle, the evolutionary epic of Lucretius, and analogous endeavours towards an ætiology, the first serious interpretation of organic nature is that of Buffon. Buffon (1707–88), Erasmus Darwin (1731–1802), and Lamarck (1744–1829) may be called the three old masters in ætiology, and along with these we must associate Treviranus (1776–1837), Geoffroy St Hilaire, Goethe, and Oken. But the great master of them all was Charles Darwin, fellow-workers with whom have been Alfred Russel Wallace, Herbert Spencer, Ernst Haeckel, and Thomas H. Huxley. Of recent years most of the leading zoologists have contributed to the discussion of the problems of evolution.

BIBLIOGRAPHY.—*General History of Zoology.*—See articles ANATOMY, BIOLOGY, CELL, EMBRYOLOGY, EVOLUTION, PHYSIOLOGY, PROTOPLASM; J. V. Carus, *Geschichte der Zoologie* (1872); W. Whewell, *History of Inductive Sciences* (1840); E. Perrier, *La Philosophie Zoologique avant Darwin* (1884); E. Haeckel, *Natural History of Creation* (trans. Lond. 1879); E. Ray Lankester, article 'Zoology,' *Encyclopædia Britannica;* H. A. Nicholson, *Natural History: its Rise and Progress in Britain* (1888); E. Krause, *Die allgemeine Weltanschauung* (1889); J. Arthur Thomson, *Science of Life* (1899).

Monographic Series.—*Reports of the Voyage of H.M.S. 'Challenger,' Fauna und Flora des Golfes von Neapel, Catalogues of British Museum—Natural History.*

General Works.—Bronn's *Klassen und Ordnungen des Thierreichs* (1859 *et seq.;* since re-edited by various authorities), Brehm's *Thierleben* (new ed. 13 vols. 1912 *et seq.*), Leunis, *Synopsis des Thierreichs* (ed. by Ludwig, Hanover, 1886), W. Hatchett Jackson's edition of Rolleston's *Forms of Animal Life* (Oxford, 1888), Delage and others, *Traité de Zoologie Concrète* (5 vols).

General Morphology.—Haeckel, *Generelle Morphologie* (1866); H. Spencer, *Principles of Biology* (1864–66); W. His, *Unsere Körperform* (1875)—cf. *Proc. Roy. Soc. Edin.* (1888); Geddes, 'Morphology,' *Ency. Brit.*

Comparative Anatomy.—G. Cuvier, *Leçons d'Anatomie comparée* (5 vols. 1708–1805; 2d ed. 8 vols. 1835–46; J. F. Meckel, *System der vergleich. Anat.* (6 vols. 1821–1833); H. Milne-Edwardes, *Leçons sur la Physiologie et l'Anatomie comparée* (14 vols. 1857–81); F. Leydig, *Lehrbuch der Histologie* (1857); C. Bergmann and R. Leuckart, *Anat.-physiol. Uebersicht des Thierreiches* (1852); R. Owen, *Comparative Anat.* (4th ed. 1871); Huxley, *Anatomy of Invertebrates* (1877) and *Vertebrated Animals* (1871); C. Gegenbaur, *Comparative Anatomy* (trans. by F. Jeffrey Bell, revised by Ray Lankester, 1878); C. Claus, *Text-book of Zoology* (trans. by Sedgwick, 1884–85); R. Wiedersheim, *Comparative Anat. of Vertebrata* (trans. by W. N. Parker, 1886); A. Lang, *Text-book of Comp. Anat.* (trans. by H. M. and M. Bernard); Bourne, *Introduction to Comparative Anatomy* (2 vols. 1900–2); Reynolds, *The Vertebrate Skeleton* (1897); Oppel, *Vergleichende mikroskopische Anatomie* (1896–1905).

Comparative Physiology.—Claude Bernard, *Phénomènes de la Vie Commune aux Animaux et aux Végétaux* (1878); Paul Bert, *Leçons sur la Physiologie comparée de la Respiration* (1870); Krukenberg, *Vergleichend-physiologische Studien* and *Vorträge* (1881–89); F. Jeffrey Bell, *Comparative Anatomy and Physiology* (1887); A. B. Griffiths, *Comparative Physiology* (1891); Halliburton, *Physiological Chemistry* (1891); Fürth, *Vergleichende Physiologie* (1903); Pearse, *Animal Ecology* (1926); Rogers, *Comparative Physiology* (1927); Hempelmann, *Tierpsychologie* (1926).

Embryology.—F. M. Balfour, *Comparative Embryology* (1880–81); M. Foster and F. M. Balfour, *Elements of Embryology* (2d ed. by Sedgwick and Heape, 1883);

O. Hertwig, *Lehrbuch der Entwickelungsgeschichte* (2d ed. 1888; French ed. by Julin); E. Korschelt and K. Heider, *Entwickelungsgeschichte der wirbellosen Thiere* (1890 *et seq.*); Milnes Marshall, *Vertebrate Embryology* (1893); Minot, *Human Embryology* (1892); E. B. Wilson, *The Cell in Development and in Inheritance* (1900).

Palæontological.—H. A. Nicholson and R. Lydekker, *Palæontology* (1889); K. A. von Zittel, *Text-book of Palæontology* (1900); M. Neumayr, *Die Stämme des Thierreichs* (vol. i. 1889); A. Gaudry, *Les Enchaînements du Monde Animal* (1888–90); Smith Woodward, *Vertebrate Palæontology* (1898).

Geographical Distribution.—A. R. Wallace, *Geographical Distribution* (1876); A. Heilprin, *Geographical and Geological Distribution* (1887); Lydekker, *Geographical Distribution of Mammals.*

Books of Travelling Naturalists—e.g. C. Darwin, *Voyage of the Beagle* (Lond. 1844); H. W. Bates, *Naturalist on the Amazons* (new ed., with Life by E. Clodd, Lond. 1892); T. Belt, *Naturalist in Nicaragua* (2d ed. 1888); A. R. Wallace, *Malay Archipelago* (1869), *Tropical Nature* (1878), *Island Life* (1880); Wyville Thomson, *The Depths of the Sea* (1873), *Voyage of the Challenger* (1885); H. N. Moseley, *Naturalist on the Challenger* (1879; new ed. 1892).

Ætiological.—Darwin, *Origin of Species* (1859), &c.; Herbert Spencer, *Principles of Biology* (1864–66); Haeckel, *Generelle Morphologie* (1866), &c.; A. R. Wallace, *Darwinism* (1889), &c.; Weismann, *Evolution Theory* (1905); T. H. Morgan, *Experimental Zoology* (1907); R. Lull, *Organic Evolution* (1917); Geddes and Thomson, *Evolution* (1911).

Practical Manuals.—A. M. Marshall and C. H. Hurst, *Practical Zoology* (7th ed. 1912); T. J. Parker, *Zootomy* (1884); W. K. Brooks, *Invertebrate Zoology* (Boston, 1882); T. H. Huxley and H. B. Martin, rev. ed. by G. B. Howes and D. H. Scott, *Elementary Instruction in Practical Biology* (1888); T. J. and W. N. Parker, *Practical Zoology* (1908); A. Bolles Lee, *Microtomist's Vade Mecum* (2d ed. 1891); Guyer, *Animal Micrology* (1909).

Text-Books.—Parker and Haswell, *Text-book of Zoology* (2 vols. 1897); Sedgwick, *Students' Text-book* (3 vols. 1898–1909); Lankester, *Treatise on Zoology* (1900–9); Thomson, *Outlines of Zoology* (7th ed. 1921); Shipley and MacBride, *Zoology* (1901); Graham Kerr, *Zoology* (1925).

General Natural History.—*Cambridge Natural History* (10 vols. 1895–1909), Brehm's *Thierleben* (re-edited by Zur Strassen and others, 13 vols. 1912 *et seq.*); Cassell's *Natural History* (ed. Martin Duncan, 6 vols. 1882); *Standard* or *Riverside Natural History* (ed. Kingsley, 6 vols. 1888); Lydekker's *Royal Natural History* (8 vols. 1894–97); J. Arthur Thomson's *New Natural History* (3 vols. 1926).

Zoophyte (Gr. *zōon*, 'an animal,' and *phyton*, 'a plant'), a term meaning plant-like animal, vaguely applied by Cuvier to numerous sedentary animals, often with a superficial resemblance to plants. It is often still used as a popular name for hydroid colonies (see HYDROZOA), and it is sometimes extended to the Polyzoa or Bryozoa as well. It would be more accurate if read backwards, *phytozoon*, or plant-like animal.

Zoospore, a Spore (q.v.), capable of spontaneous movement, generally by means of cilia, occurring in certain algæ and fungi.

Zoppot, a port and seaside resort in the territory of the free city of Danzig, 7 miles NW. of Danzig; pop. 27,500.

Zorilla y Moral, JOSÉ (1817–93), Spanish poet and dramatist, was born at Valadolid, was educated at Toledo and Madrid, and published his first volumes of verse in 1837. His efforts to make a fortune in Mexico (where he lived 1855–66) were unsuccessful, and in 1871–83 he suffered great poverty. Latterly he was given a government pension. His work, intensely national in spirit and romantic in treatment, includes the collection of legends *Cantos del trovador* (1841), the unfinished epic *Granada* (1852), the plays (many of which were very successful) *Don Juan Tenorio* and *Traidor* (1845). But Zorilla was too prolific a writer. He published an autobiography, *Recuerdos del tiempo viejo* (1880).

Zorn, ANDERS (1860–1920), Swedish painter, was born of farming stock at Mora in Sweden, and studied at Stockholm, Paris, and London. His pictures, dealing mostly with peasant life but also including portraits, are characterised by a robustness and fulness of colour that are always satisfying to the eye. He was also a sculptor of some note, and an excellent etcher.

Zorndorf, a Brandenburg village, 5 miles N. of Küstrin, where on 25th August 1758 Frederick the Great defeated the Russians in one of the bloodiest battles of the Seven Years' War (q.v.).

Zoroaster. Ζωροάστρης, or Ζαθραύστης (so the Greeks pronounced the name of Zarathushtra), the founder or reformer of the ancient religion of the Parsees, appears as a historical person only in the earliest portion of the Avesta, the Gâthic hymns, where the aspirations, hopes, and fears of an actual human agent are unmistakably present. His name may denote him as an owner of 'Bay-camels' or of 'Old-camels,' *ushtra* being a frequent element in a compound, as in 'Fleet-camels,' Frashaoshtra. His father was Pourushaspa, owner of 'Many-horses'; his wife was Hvogvi (i.e. of the Hvogvas); his daughter was Pouru-chistâ, 'the Discreet.' His family name was Spitama, 'White.' This much we may accept from the documents, but as soon as we leave the last Gâthâ, which was the wedding-song of his daughter, we have no reliable data. Whether he was born in Raghâ, the home of the kin of his mother Dughdhova, and the 'Zarathushtrian' province (possibly later so called from its having become a political and ecclesiastical centre), or in Atropatene, or nearer the scene represented in the *Vendîdâd* (chap. i.), where countries to the east are mentioned, it seems certain that all the persons named in the Gâthâs must have been living beside him. *Yasna*, xlvi. 1, with its 'to what land (district) shall I turn?' has suggested that he had to seek elsewhere than in his own land for a patron, and it has been held that from the west he wandered to Bactria to find a patron in Vîshtâspa, and that it was thence that his views penetrated westwards. At any rate he appears in the Gâthâs as carrying on with varying success a political, military, and theological struggle for the defence or wider establishment of a holy agricultural state, whose laws and principles encouraged pastoral labour, tillage, and thrift, as against the freebooting tendencies of Turanian and Iranian nomad aggressors. In the course of his career he composed religious-political hymns, the Gâthâs, of which we have now only fragments surviving in metres which appear in the *Ṛik* and in other parts of the Veda. The period in which he lived is even more uncertain than that of Homer, but cannot be placed later than 600 B.C., and may be greatly earlier. On the whole, *c.* 1000 B.C. accords best with probability.

See PARSEES, and ZEND; Marion Crawford's novel, *Zoroaster*; Jackson's *Zoroaster the Prophet of Iran* (1899); Lehmann's *Zarathustra* (1899–1902); Moulton's *Early Zoroastrianism* (1913).

Zosimus, a Greek historian. Virtually nothing is known as to his life. Formerly he was assigned to the first half of the 5th century A.D., but is now generally accepted as having been a contemporary of the Emperor Anastasius I. (491–518). According to Photius he held office in the Roman imperial treasury at Constantinople. His *Historia Nova*, a compilation mainly from earlier writers, is one of the chief authorities for Roman history, more especially of the 4th century. It is in six books; the first sketches the history of the Roman emperors from Augustus to 305 A.D., the other five deal more minutely with the period ending at 410. His style

is concise, clear, and interesting. He seeks to unfold the causes of the decline of the empire, and, not being himself a Christian, he adduces as the chief the neglect of the old Roman religion. The best editions are by Bekker (1837) and Mendelssohn (1887).—For Pope Zosimus (417–418), see PELAGIUS.

Zostera. See GRASSWRACK.

Zouaves, a body of troops in the French army, which derives its name from the Zwawa, a tribe of Kabyles in the Algerian province of Constantine. These Kabyles had long been employed as mercenaries by the deys of Algiers; and after the conquest in 1830 the French took them into their service. At first companies were formed consisting of French and Kabyles in certain proportions; but as it was soon found that commingling the two races did not promote the comradeship intended, the French and Kabyles were formed into separate companies. Their first colonel was Lamoricière, under whom and his successor, Cavaignac, they distinguished themselves in many a bloody conflict with the Arabs of the south. Gradually however the native element was eliminated, and since 1840 the Zouaves may be considered as French troops in a quasi-Moorish dress. The Africans were constituted into a separate body, under the name of Algerian Tirailleurs, a force still recruited in Algiers to form a part of the regular French army. They are usually spoken of as *Turcos*. In 1861 a corps of foreign (mainly French) soldiers was organised at Rome as Papal or Pontifical Zouaves, under Allet; they were disbanded in 1870.

Zoutpansberg, a ridge of mountains (3000–5000 feet) in the north-east of the Transvaal, which is a continuation of the Drakenberge (q.v.). Here were some of the earliest (1867–70) European gold-workings in Africa south of the Limpopo.

Zrinyi, COUNT MIKLÓS (1508–66), Hungarian general, famous for his brilliant campaigns against the Turks, but especially for his heroic defence of Sziget, when a garrison of 2500 kept at bay the whole Turkish army of 65,000 under Solyman from 6th August to 7th September 1566. The story of the death of Zrinyi in a last desperate sortie was told in epic form (*The Fall of Sziget*, 1651) by his great-grandson, COUNT MIKLÓS ZRINYI (1616–64), also a successful warrior in the Turkish wars.

Zschokke, JOHANN HEINRICH DANIEL, an eminent German writer, was born at Magdeburg, 22d March 1771. He ran away from school, was some time a strolling playwright, then a student at Frankfort-on-the-Oder, afterwards lectured there and adapted plays, set out on travels and finally opened a boarding-school at Reichenau in the Grisons, becoming a Swiss citizen. In 1798 he published his *Geschichte des Freistaats der drei Bünde in Rhätien*, then removed to Aarau, where he was employed as a commissioner to settle the affairs of Unterwalden, Uri, Schwyz, and Zug; later he was a member of the Great Council of Aargau. He died at Aarau, 27th June 1848. His books include histories of Bavaria and of Switzerland, and a long series of tales, among them *Der Creole*, *Alamontade*, *Jonathan Frock*, *Clementine*, *Oswald*, and *Meister Jordan*. The most popular of all his writings was the *Stunden der Andacht* (1809–16), translated as *Hours of Meditation and Reflection* (1843). This was a Sunday periodical, supplying a complete exposition of modern rationalism, with eloquence and zeal for sound morality.

Zschokke's collected writings fill 35 vols. (1851–54). A few of his tales (*Goldmaker's Village*, *Lover's Stratagem*, *Veronica*, &c.) have been translated into English. See his *Selbstschau*, a kind of autobiography (1842; Eng. trans. 1847); also Lives by Emil Zschokke (3d ed. 1876) and Born (1886), and Keller's *Beiträge zur Politischen Thätigkeit H. Zschokkes 1798–1801* (Aarau, 1887).

Zschopau, a town of Saxony, 15 miles SE. of Chemnitz, with textile industries; pop. 7000.

Zuccaro, TADDEO (1529–66), painter, has left a number of pretentious but not valuable frescoes at Rome, and a few easel-pieces of no especial merit.—His younger brother, FEDERIGO (1543–1609), possibly the most popular painter of his generation, had some merit as a painter of portraits and other works in oil (he painted Queen Elizabeth, Mary, Queen of Scots, &c., during a temporary exile), but gave most of his time to tasteless frescoes—he disfigured Florence cathedral with some 300 figures nearly 50 feet high and extravagant in attitude, which time, however, has mercifully done much to hide. Zuccaro decorated the Escorial for Philip II. of Spain, and founded at Rome in 1595 the Academy of St Luke, which suggested to Reynolds the idea of the Royal Academy.

Zug, the smallest of the Swiss cantons (cantons formed by division excluded), has an area of 92 sq. m. and a pop. (1920) of 31,569. The south-eastern part borders on the Alpine region, and is hilly and pastoral; the north-western part, enclosing a great part of the Lake of Zug, is a rich and beautiful country of cornfields and orchards. The inhabitants speak German, and are Catholics. The canton joined the confederation in 1352.—ZUG, the picturesque mediæval capital, situated at the north-east end of the lake, 24¼ miles from Zürich by rail, contains the Gothic church of St Oswald (1478–1515), and has a pop. (1920) of 9499. Many persons were killed in July 1887 by the fall of about thirty houses into the lake, which is altogether some 9 miles long and 2½ miles broad.

Zugspitze, the highest peak in Germany, is situated on the borders of Tirol, 54 miles SSW. of Munich, 9725 feet high.

Zuider Zee (or ZUYDER ZEE), a large gulf penetrating deep into the Netherlands, between 52° 26′ and 53° 20′ N. lat., about 80 miles in length, 210 miles in circumference, and with a total area of 2027 sq. m. The greatest width is 34 miles, but a strait of about 10 miles separates the inner and the outer portions of the Zuider Zee. The average depth is about 12 feet, but while some of the sea-channels are over 30 feet, there are considerable portions not deeper than 3. The bottom is clay or sandy. The islands of Texel, Vlieland, Terschelling, Ameland, and Schiermonnikoog, reaching in a chain from the most northern point of Holland, are the remains of the former line of coast, which form a breakwater against the North Sea. From Dunkirk in French Flanders to the north of Holland the interior is defended from the sea by sandhills or dunes. Here, as at the mouth of the Scheldt, the sand-barrier was broken, and in 1282 the waters overflowing the low lands separated the province of Friesland from the peninsula of North Holland, and, having united with the small inner Lake Flevo, formed the present Zuider Zee. In it lie the islands Wieringen, Urk, Schokland, and Marken, while the principal river flowing into it is the Yssel, an arm of the Rhine. Fishing is carried on.

As the Zuider Zee is not navigable for ships of any size, owing to the extreme shallowness of much of it, two canals have been cut from Amsterdam. The North Holland Canal, north to Nieuwe Diep near the Helder, was opened in 1825, and the North Sea Canal, west to Ymuiden, in 1876. The construction of the latter, which is the shorter and much the more important of the two (see CANALS, fig. 4), led to the drainage of 12,000 acres of rich land on either bank of the Y, a south-west arm of the Zuider Zee, while a huge dam with five locks was thrown over the eastern mouth

of the Y at Schellingwoude. A scheme for draining the Zuider Zee, recommended first in 1891, was finally sanctioned by parliament in 1918. The dam between North Holland and the island of Wieringen has been finished and that between Wieringen and Harlingen in Friesland begun. This dam, about 20 miles long, is to carry both a railway and a road. It is proposed thus to make 4 polders by reclaiming some 550,000 acres (which would be more than 10 feet below sea-level), and to create a fresh-water lake, Lake Yssel, of some 280,000 acres (see map at HOLLAND). Compensation will be given to the fishermen, but the government will recoup itself by leasing out the reclaimed land, which, being very fertile soil, will accommodate 300,000 people. It is estimated that the works will be finished in 1934. See HOLLAND (*Physical Aspect*), POLDER; Havard, *The Dead Cities of the Zuyder Zee* (1876; trans. from French of 1874).

Zuloaga, IGNACIO, born at Eibar in the Basque country in 1870 the son of a metal-worker, studied painting at Rome and Paris, and by the end of the century was recognised—first abroad, then at home—as the reviver of the national tradition in Spanish painting. His style, with its bold colouring, is both realistic and decorative. See Studies by Bénédite (1912), Mauclair (1925).

Zululand, the north-east portion of Natal (q.v.), extending from the Tugela River to Portuguese East Africa; area, 10,450 sq. m.; pop. (1921) 250,829 natives, 3985 whites. It is well suited for agriculture (sugar, tea, &c.) and cattle-raising; gold is worked; and silver, lead, copper, tin, asbestos, and coal are found. It is but a small part of the country (now largely absorbed in the Transvaal) formerly ruled over by the Zulus (q.v.).

Zulus (*amaZulu*), a distinguished branch of the Bantu (q.v.) race. They are conspicuous for bravery and fine physical development. Under their own regime, 1812 to 1879, they were given to martial exercises, hunting, and dancing, also to intertribal strife, and forays beyond their borders. The Zulu polity is patriarchal, in some respects analogous to that of the ancient Hebrews. Polygamy, except in the case of converts to Christianity, is universally practised, a number of cattle (generally ten) being in each case handed over by the bridegroom to the bride's father by way of compensation for loss of the girl's services, as well as guarantee that she will be well cared for in her new home. The heads and subheads of tribes, also heads of families, are hereditary, the heir in each case being the eldest son of the chief wife. Prior to Tshaka's day, every tribe was more or less independent of the others. When, however, the tribes, including those in Natal, were conquered and welded into a nation by Tshaka, each chief and his followers became subordinate to him as king, a system which, in spite of numerous vicissitudes, has continued down to the present time. In 1887, however, sovereignty became vested in the British crown. A very complete code of law, civil and criminal (only of late years committed to writing) exists, and is well known to every adult Zulu. As a race, the Zulus are conspicuous for their morality, hospitality, and respectful bearing, also for freedom from drunkenness and crime; but, owing to increasing contact with European races, neither their morals nor their manners are as elevated as they once were. Missionary efforts to christianise have been more tolerated and acquiesced in than successful. In recent years, however, greater progress has been made, chiefly owing to their own keen desire to be educated along civilised lines. The pursuits of the people are pastoral, their staple food being maize (mealies, *Milium*) and mabele (*Andropogon sorghum*). Trading is little known, and their arts are limited to the primitive needs of simple iron-work; ornaments of copper, bone, horn, and feathers; basket and mat making; carving of sticks, &c.; and the preparation of cow, wild-cat, monkey, and other skins for purposes of dress.

In the beginning of the 19th century, the Zulus proper were a small clan. Responding to the ambition of their warlike chieftain Tshaka, they successively attacked many of the surrounding tribes, most of them larger and more powerful than their own. Such as did not promptly tender their allegiance to Tshaka were obliged to flee west, south, and north, a process that so disturbed the thickly-populated and peaceful areas through which their course lay that the latter inhabitants, becoming panic-stricken, also took part in the general flight. As a consequence of this far-flung catastrophic upheaval, upwards of a million souls are calculated to have perished between 1810 and 1828 (the year of Tshaka's assassination). Tshaka succeeded in dominating an area as large as France. In some respects, he was probably the most remarkable despot the world has ever known. He introduced the single stabbing-assegai, which compelled the bearer invariably to attack at close quarters, whilst those who showed cowardice were summarily put to death.

In 1824, the earliest European settlers in that part of South Africa began to arrive at Port Natal. Tshaka treated them at all times with special consideration and liberality. He was succeeded by Dingana, towards the conclusion of whose reign (1837), Boers arrived from the Cape Colony and applied to him for such parts of Natal as were then unoccupied. Dingana at once became intensely suspicious, unjustifiably concluding that the Boers intended to act treacherously towards him. Accordingly, in February 1838, after having invited them into his chief kraal, he treacherously put to death Piet Retief and his party (100 in all), whilst some 530 Boer men, women, children, and servants, who had entered Natal with their wagons in anticipation of the land applied for being granted, were at the same time ruthlessly massacred. These monstrous proceedings so inflamed the Boers that, with a commando of 467, they invaded Zululand, and, at Blood River, in December 1838, succeeded in decisively defeating Dingana's army. Dingana fled to uBombo, where he was soon murdered by a party of Swazis. He was succeeded by Mpande, who ruled the country wisely from 1840 to 1873. The principal event of this long reign was the hostilities that broke out between his principal sons, Cetshwayo and Mbuyazi, in 1856, in regard to the question of succession. The latter's army was annihilated at Ndondakusuka, near the Tugela. Cetshwayo became king in 1873. In 1879, hostilities broke out between him and the British Government. Sir Bartle Frere, the then High Commissioner for South Africa, assumed the policy that British interests in the territories bordering on Zululand were threatened by the existence of the independent nation occupying that country. He sent an ultimatum to Cetshwayo in December 1878, which the latter felt it quite impossible to comply with. War was declared on the Zulus. Five columns were thrown into the country, under the supreme command of Lord Chelmsford. The main column (under Colonel Durnford) was annihilated by the Zulus at Isandhlwana (Isandula, q.v.) on 22d January 1879. The gloom of the disaster was slightly relieved by the heroic and historic defence of Rorke's Drift (q.v.). The other columns, notably that under Colonel Evelyn Wood, defeated the Zulus at Gingindhlovu, Kambule, and Hlobane, whilst, on 4th July, when reinforcements were being hurried forward from England, and General Sir G. Wolseley

was on his way to take over supreme command, Chelmsford won the final and decisive battle at Ulundi. The Zulus admitted themselves beaten. Cetshwayo went into hiding, but was soon captured and sent to Capetown. In July 1882, he visited England. England was opposed at the moment to the policy of annexation, despite the wish of the subjugated people. The home authorities appointed thirteen independent chiefs, with the result that internecine strife ensued. Cetshwayo was restored to Zululand in 1883, though only to a portion of the country. Hostilities almost immediately broke out between him and Zibebu. These resulted in Cetshwayo fleeing from his area and dying in exile at Eshowe early in 1884. His son Dinuzulu secured the assistance of the Boers against Zibebu, the former being subsequently rewarded for their services with a large tract of land in the north-west of Zululand. The remainder of the country was annexed to Great Britain in 1887, but in 1897 became an integral part of Natal. In the Boer war of 1899–1901, several incursions were made into Zululand by the Boers, but the natives remained loyal amidst all attempts to rouse them against Britain. In consequence of the imposition of a poll-tax by the Natal government in 1905, a rebellion broke out in Natal and Zululand in 1906, headed by a Natal chief, Bambata. This man was to some extent aided and abetted by Dinuzulu. The military operations that ensued were under the command of Colonel D. M'Kenzie (afterwards Brigadier-General Sir Duncan M'Kenzie). Bambata was killed in action. Dinuzulu was not arrested until December 1907. He was subsequently tried at Greytown, W. P. Schreiner, ex-premier of the Cape Colony, defending. The more serious charges were not proved. He was, however, found guilty of harbouring rebels, when a sentence of four years' imprisonment was passed on him. On the Union Government being established (1910), an arrangement was come to by General Botha's ministry under which Dinuzulu agreed to accept domicile in the Transvaal on condition of being released from custody. He died there in 1913, leaving Solomon as his heir.

See H. F. Fynn's Papers in J. Bird, *Annals of Natal* (1888); N. Isaacs, *Travels and Adventures in Eastern Africa* (1836); J. Shooter, *Kafirs of Natal, &c.* (1857); L. Grout, *Zululand* (1862); J. Y. Gibson, *Story of the Zulus* (1904); R. Russell, *Natal, the Land and its Story* (1911); J. Stuart, *History of the Zulu Rebellion, 1906* (1913).

Zumalacárreguy, TOMÁS, the greatest of the generals of Don Carlos during the civil war of 1833–40, was born in 1789 at Ormáiztegui, in the Biscayan province of Guipúzcoa. He left his studies at Pampeluna to fight under Mina against Napoleon, and afterwards served under Quesada in the 'Army of the Faith'; and on the re-establishment of absolutism he was raised to the rank of colonel, and appointed governor of Ferrol. For his leaning to the party of the Carlists he was tried by court-martial but acquitted; in 1832 with other Carlists he was dismissed the army. But in 1833 the rising of the Basque population called him to head the Carlist insurrection. His motley army was without uniform, ill-fed, and ill-paid, yet the vigour and personality of 'el Tío Tomás' were such that he was able to maintain effective discipline. He kept his opponents at bay, defeated Rodil in the valley of Améscoas, routed another force of Cristinos at Viana, gained a second victory in the Améscoas valley, completely defeating Valdez, after a battle of four days, and routed Iriarte near Guernica. These brilliant successes turned the weak head of Don Carlos, and led him to interfere with the plans of his daring and devoted general, who was anxious to strike for Madrid when the Cristinos were paralysed with terror. Zumalacárreguy was ordered to lay siege to Bilbao, but was wounded (slightly) by a musket-ball, and died (it is generally held owing to unskilful treatment, though at the time some said because of poison inserted into the bandages—see *Blackwood's Magazine*, July 1846) ten days later, 15th June 1835. See CARLISTS; Henningsen's *Twelve Months' Campaign* (1836), *Blackwood's Magazine* for August 1845, and the *Cornhill Magazine* for January 1871.

Zumbo. See ZAMBEZI.

Zumpt, KARL, philologist, was born at Berlin, 20th March 1792, studied at Heidelberg and Berlin, and after holding posts in various higher schools in Berlin became in 1827 extra-ordinary, and in 1836 ordinary professor at the university there, and died 25th June 1849. His best-known work is the *Lateinische Grammatik* (1818; 13th ed. by A. W. Zumpt, 1874). He produced also editions of Curtius (1826 and 1849), of Quintilian (1831), of Cicero's *Verrine Orations* (1830; and Commentary, 1831) and *De Officiis* (1837), and wrote books on the Roman knights (1839), the numbers of the population in ancient states (1841), the philosophical schools of Athens (1843), the Roman dwelling-houses (1844), Roman religion (1845), and the legal standing of the Roman citizen (1846). See a Life (1851) in Latin by his nephew.—This nephew, AUGUST ZUMPT (1815–77), born at Königsberg, studied in Berlin, lectured in gymnasia there, and was especially distinguished in Latin epigraphy.

Zungaria (Dzungaria, or Sungaria), in the north of the Chinese province of Sin-kiang, lies between the central Tian-shan highlands of the Russo-Chinese frontier and the western Altai, and is a high mountain region, in which are the sources of the Black Irtish and the Ili, including lakes, steppes, valleys and fertile plateaus, besides barren mountain. Some minerals are found. The Mohammedan inhabitants, the Dungans, may, with Chinese, number 500,000. The former historically important Mongolian kingdom of Zungaria, at the height of its power in the second half of the 17th century, but about 1757–59 completely destroyed by the Chinese invasion, covered a much wider area.

Zungeru, a town in Nigeria, 75 miles N. of Egga on the Niger and 257 SW. of Kano by rail.

Zuñi, the largest of the Pueblos (q.v.).

Zunz, LEOPOLD (1794–1886), born at Detmold, settled in Berlin, and greatly promoted the scholarly study of Jewish religious worship and literature, and the history of the synagogue.

Župančič, OTON, Slovene poet, was born in 1879. His work is lyric and idealistic; in spirit it is allied to the old Slavonic folk-songs, but the treatment is modern in its extreme technical accomplishment. See SLOVENIANS.

Zupitza, JULIUS (1844–95), born at Kerpen near Oberglogau in Upper Silesia, became professor of English at Berlin, greatly promoted Old English and Middle High German studies, edited many texts (e.g. *Beowulf* and *Guy of Warwick* for the E. E. T. S.), and was vice-president of the German Shakespeare Society.

Zurbarán, FRANCISCO (1598–1662), Spanish painter, was born the son of a labourer in Estremadura, who got him into the studio of Roelas at Seville. There he spent most of his life, studious and laborious; his subjects are mostly of a religious and ascetic nature, sombre in colour and realistic in treatment. He was known as the 'Spanish Caravaggio,' and after Velázquez and Murillo is in the first rank of Spanish painters. Much of his work is to be found in Seville.

Zürich (Fr. *Zurich*), a northern canton of Switzerland, drained by the Rhine and its tributaries, and traversed from NW. to SE. by ridges of hills, between which lie the valleys (followed by railway lines) of the Töss, the Glatt, and the Limmat. The last drains the beautiful Lake of Zürich, which, lying 1341 feet above sea-level, is 25 miles long, and 2½ miles broad at the widest. Zürich has not a fertile soil, but it is carefully cultivated with vines, fruit, grain, &c. The canton, however, is essentially of industrial importance, the chief industries being silk, cotton (the canton was one of the earliest seats of this manufacture in Europe), and engineering. Zürich, then a free imperial city, joined the confederation in 1351, the canton as it stands to-day representing simply the acquisitions made in the course of history by the town (see below). Area, 666 sq. m. Pop. (1920) 538,602, German-speaking and Protestant.

ZÜRICH, the capital of the canton, and the largest town in Switzerland, 41 miles by rail NNE. of Lucerne and 43 NW. of Glarus, is situated at the point where the Limmat issues from the Lake of Zürich and unites with its tributary, the Sihl. The narrow streets and lofty houses of the old part on the high ground east of the river give it the quaint appearance of a mediæval city, but the modern part has wide streets, broad quays, and handsome boulevards. The principal buildings are the Romanesque cathedral or Gross-Münster (11th–13th cent.), where Zwingli preached; the Frau Münster church, begun in the 12th cent. and modernised in the 20th; the 17th-cent. town-hall; the Swiss National Museum (opened 1898) with an excellent collection of Swiss antiquities, furniture, historic relics, &c.; the Central Library, containing some 200,000 books, also manuscripts, prints, maps, coins, &c.—an amalgamation made in 1916 of the city, cantonal, and other libraries; the new buildings (1914) of the university (founded 1832); the Federal Polytechnic (founded 1854, the present buildings dating from 1861–64). The Pestalozzianum contains educational exhibits, and the art gallery a representative collection of Swiss paintings. Excellent views of the city, lake, and Alps can be obtained from the Zürichberg (2285 feet) to the E. of the city, and from the Utliberg (2864 feet) to the SW. Besides being an intellectual centre, Zürich is the most important industrial and commercial town of Switzerland, and there are flourishing manufactures of silk, cotton, paper, machinery, &c. Pop. (1870) 56,695; (1901) 152,942; (1920) 207,161.

The name is possibly from the Celtic *dur* ('water'). Lake-dwellers, Celtic Helvetians, Romans, Alemanni, Franks, successively occupied the site of what from the 9th century became the Teutonic town of Zürich. In 1218 the place became a free imperial city, for a time displayed Austrian leanings, but in 1351 threw in its lot with the Swiss confederation. Thereafter it extended its rule far beyond its walls, reaching the height of its territorial power in the 15th century. (see the canton, above). At the Reformation it was a stronghold of Calvinistic Protestantism, and in 1519 Zwingli (q.v.) began to preach in the cathedral. At the battle of Zürich, in 1799, Masséna beat the Russians. Konrad von Gesner, Salomon Gessner, Pestalozzi, Lavater, and Gottfried Keller were natives. See Dändliker, *Geschichte der Stadt und des Kantons* (3 vols. 1908–12).

Zutphen, a town in the Dutch province of Guelderland, on the Yssel, here joined by the Berkel, 18 miles NNE. of Arnhem by rail. Of buildings the chief are the Great Church (1103; restored 1857) with an interesting interior, the 'Wijn Huis' tower, and some picturesque old houses. The pre-Reformation library in the Great Church chapter-house contains some valuable mediæval bibles and incunabula. At Rysselt, 3 miles N., is the boys' reformatory of 'Nederlandsch Mettray' (1851). Zutphen has manufactures of bricks, leather, &c., and there is some trade in timber. It has been several times besieged; and in a skirmish on the field of Warnsfeld, a little to the east, Sir Philip Sidney (q.v.), of whom there is a statue (1913), received his death-wound from a Spanish bullet, in 1586. Pop. 20,000.

Zuyder Zee. See ZUIDER ZEE.

Zvenigorodka, a town of Ukraine, 100 miles S. of Kiev, with a trade in tobacco and agricultural produce; pop. 40,000.

Zvornik, a fortified town of Bosnia, which the Austrians occupied in 1878 only after severe fighting, situated on the left bank of the Drina, about 60 miles NE. of Sarajevo.

Zweibrücken (Fr. *Deux-ponts*, 'two bridges'), an ancient county, from 1410 a duchy, incorporated after 1799 (in 1801–1814 it was in French possession—see PALATINATE) in the Rhenish Palatinate. Its old capital, Zweibrücken (Lat. *Bipontinum*), 45 miles by rail W. of Landau, has a large castle (now a court-house), manufactories of machinery, silk, leather, &c., and is notable for its Bipontine edition of the classics, beautifully printed at the ducal press from 1779. Pop. 16,000.

Zweig, STEFAN, Austrian writer, was born of Jewish parents at Vienna in 1881. He has published poems (*Die frühen Kränze*, &c.), novels (*Erstes Erlebnis*, &c.), dramas (*Thersites*, &c.); and has translated Verhaeren and Verlaine, besides writing excellent critical studies (which have been translated into English) of these two poets.

Zwickau, a picturesque city of Saxony, irregularly built in its older portions, in a pleasant valley on the left bank of the Mulde, 82 miles by rail SW. of Dresden. Of its churches the most noteworthy is the Gothic Marienkirche, which dates from 1451, was restored in 1885–91, and has a tower 285 feet high and a great bell. The town-hall (1581) has original manuscripts of Hans Sacks and documents dating back to the 13th century. The old castle has been converted into a prison, while the late Gothic *Gewandhaus* (cloth merchants' hall, 1522–24) is now in part a theatre. The town has manufactures of textiles, machinery, &c., but the chief source of its wealth is the rich beds of coal in the surrounding district. Schumann was a native. Pop. (1925) 80,664.—For the Prophets of Zwickau, see ANABAPTISTS.

Zwingli, HULDREICH (Latinised *Ulricus Zuinglius*), the Swiss Reformer, was born at Wildhaus, at the head of the Toggenburg valley, canton of St Gall, January 1, 1484. He made his studies in philosophy and humanity at Bern and Vienna, in theology at Basel under Thomas Wyttenbach, and was appointed priest at Glarus in 1506. Here he devoted himself to study and taught himself Greek, learning by heart the epistles of St Paul. At that time the Swiss hired out their soldiers to foreign states, and Zwingli twice (1512 and 1515) accompanied the men of Glarus as field-chaplain. In 1516 he was transferred to Einsiedeln, then as now a great resort of pilgrims to the shrine of the Black Virgin. Zwingli made no secret of his contempt for the superstition of such pilgrimages, and all the papal promises of promotion failed to purchase his silence. In December 1518 he was elected to be preacher in the minster at Zurich, and one of his first duties was to rouse the council not to admit within the city gates Bernhardin Samson, who had been selling indulgences throughout the Forest Cantons. He now began to preach plain

gospel truth with greater boldness than ever, and his influence grew rapidly. In 1521 he succeeded in keeping Zurich from joining the other cantons in their alliance with France—'it is no sin to eat flesh on a fast-day,' said the fearless patriot-preacher, 'but it is a great sin to sell human flesh for the slaughter.' The Bishop of Constance now sent his vicar-general to Zurich, but he was quickly silenced in debate by the Reformer (January 29, 1523), in presence of the council and six hundred men. His utter discomfiture was followed by the formal adoption by the city of the Reformed doctrines as set forth in Zwingli's sixty-seven theses. A second disputation followed in presence of nine hundred (October 26–29, 1523), with the result that images and the mass were swept away. Zwingli married Anna Meyer (*née* Reinhard), a widow of forty-three, in 1524; on Easter 1525 he dispensed the sacrament in both kinds to his congregation. Meantime the movement spread widely over Switzerland. Bern followed in 1528 after the triumphant disputation in January, then Basel, St Gall, Schaffhausen. The Anabaptists troubled the Swiss reformation (1523–26), while the great controversy with Luther, which was to rend the Protestant church, began and grew to its height. Zwingli first made public his views on the Lord's Supper (q.v.) in his famous letter to Matthaus Alber (November 16, 1524), and the first stage of the controversy closed with the fruitless conference at Marburg, brought about by Philip the Magnanimous, in October 1529. On the one side were Luther, Jonas, Melanchthon, Osiander, Stephanas Agricola, and Brenz; on the other, Zwingli, Œcolampadius, Bucer, and Hedio. Luther insisted upon identity in doctrine being necessary amongst brethren, and his refusal to give the right hand of fellowship to Zwingli made the latter burst into tears. Of the fifteen articles prepared by Luther, there was absolute agreement on the first fourteen, and even two-thirds of the fifteenth. In his view of this last question Zwingli rejects every form of local or corporeal presence, whether by transubstantiation, impanation, or consubstantiation. He assails every form, however subtle, of the old *Capernaitic* (John, vi. 51–53, 59) conception of a carnal presence and carnal appropriation. He took his stand upon John, vi. 63, 'The flesh profiteth nothing;' but Luther wrote with chalk on the table before him, 'This is my body,' as the truth of God which nothing could explain away.

Meantime the progress of the Reformation had only aroused bitter hatred in the Forest Cantons, which foresaw the end of the traditional political importance they enjoyed in the diet. Zwingli divined that the political and religious questions could not be separated, but failed to bring the Protestant cantons to see the real nature of the crisis. Five Roman Catholic cantons formed in November 1528 a separate alliance, to which the Archduke Ferdinand of Austria was admitted a few months later. Zürich declared war in 1529 on account of the burning alive of a Protestant pastor seized on neutral territory, but bloodshed was averted for a time by the first treaty of Cappel, June 25, 1529. The Zürichers' fears were lulled into a fancied security, and Bern's jealousy of Zürich hindered co-operation, while the Forest Cantons and Zug stealthily made their preparations. At length they made a sudden dash on Zürich with a force of 8000 men, and were met at Cappel by an ill-prepared and ill-provided force of but 2000 men. The men of Zürich made a desperate resistance, but were completely defeated, and among the dead lay the great Reformer, Oct. 11, 1531. 'They may kill the body but not the soul' were his last words.

Zwingli's religious convictions came to him independently of Luther, for he was preaching substantially the Reformed doctrines as early as 1516, the year before the appearance of Luther's theses. He never had the inward struggle of Luther and Calvin, for he started from a different point from them, finding his way by degrees from Humanism to positive truth as the meaning of Scripture deepened in his mind. The inward sphere of the self-consciousness as renewed by God, in which man knows himself to be a child of God, was the region in which Luther's religious speculation lingered; Zwingli, on the other hand, emphasised the necessity laid upon man to carry out God's glory on earth by fulfilment of his will. Hence his patriotism, which sprang naturally from this religious root, and his un-Luther-like zeal for reform in the formal worship and constitution of the church, and his repudiation of everything not expressly enjoined in Scripture. Original sin he regarded as a moral disease (*morbus*), or natural defect, rather than as punishable sin (*peccatum*) or guilt. The latter term was limited to actual personal violation of God's law, but was not applicable to the natural depravity of man, itself the source of such violation. He was the first to maintain the salvation of unbaptised infants, and he believed, moreover, in the salvation of such virtuous heathens as Socrates, Plato, Pindar, Numa, Scipio, and Seneca. With regard to the universal fore-ordination and efficacious providence of God, and in regard to reprobation and election, Zwingli was as Calvinistic as Calvin or Augustine himself. As a man he was calm, intrepid, incorruptible, without the fire and genius of Luther, but with a sounder understanding and better balance of faculties. The most open-minded and liberal amongst the Reformers, he grasped the conception of a broad Christian union, beyond unessential differences in doctrine and ritual, to which it can hardly be said the Christian church has yet attained. He had no faculty for metaphysical speculation, and his four dogmatic works are terse and clear beyond most writings of their class: the Sixty-seven Articles of Zurich (1523), the Ten Theses of Bern (1528), the Confession of Faith to the German Emperor Charles V. (1530), and the Exposition of the Christian Faith to King Francis I. of France (1531)—his 'swan-song,' as Bullinger calls it, written but three months before his death.

Zwingli's *Opera* fill four folio volumes, ed. by Gualther, his son-in-law (1545). Later editions are by M. Schuler and J. Schulthess (8 vols. 1828–42; supp. 1861), and by Egli and Finsler (1905 *et seq.*). A good selection in German is that by Christoffel in 11 small volumes (1843–46), and a selection in English appeared in 1912. The chief is the *Commentarius de vera et falsa religione* (1525); the rest are mainly occupied with the exposition of Scripture and the controversies with the Papists, the 'Catabaptists,' and on the Eucharist. There are Lives by Oswald Myconius (1532; reprinted by Neander in *Vitæ quatuor Reform.* 1841), Heinrich Bullinger (ed. by Hottinger and Vögeli, 3 vols. 1838), J. M. Schuler (1819), Sal. Hess (1819), J. J. Hottinger (1841; Eng. trans. 1858), J. C. Mörikofer (1867–69), G. A. Hoff (1882), Usteri (1883), Stähelin (Basel, 1897), Jackson (New York, 1901), and Simpson (1902). For his theology, see, besides Cunningham's *Reformers* (1862), Dorner's *Hist. of Prot. Theology* (1871), and books noted at LORD'S SUPPER, the works on his doctrines by Zeller (1853), Sigwart (1855), Spörri (1866), Marthaler (1873), A. Baur (1885–89), and Thomas (Leip. 1902); also A. Lang, *Zwingli and Calvin* (1913). There is a *Zwingli-Bibliographie* by Finster (Zürich, 1897).

Zwittau (*Svitavy*), a town of Czechoslovakia in the west of Moravia, 40 miles N. of Brünn by rail, with textile manufactures; pop. 10,000.

Zwolle, capital of the Dutch province of Overyssel, on the Zwarte Water, at the junction of

several railways, 50 miles E. by N. of Amsterdam. Besides a busy transit trade it has foundries, shipyards, iron and cotton manufactures. It is a well laid out town, with a fine Gothic gateway; the Church of St Michael dates from 1406 and the town-hall from 1447. Close by is Agnietenberg, in whose monastery Thomas à Kempis lived and died. Pop. 40,000.

Zwyndrecht, a small Dutch town, on the island of Ysselmonde (or Ijsselmonde), in the Maas south of Rotterdam; pop. 8000.—Also a fortified western suburb of Antwerp, across the Scheldt.

Zygomycetes. See FUNGI, Vol. V. p. 41

Zygophyllaceæ, a family of dicotyledons, herbaceous plants, shrubs, and trees, chiefly natives of subtropical countries. The most important genus is Guaiacum (q.v.). The abundance of species of Zygophyllum and some other genera constitutes a most striking feature of North African and Arabian deserts. The flowers of *Z. Fabago* are employed as a substitute for capers, under the name of *Bean-capers.*

Zymase. See FERMENTATION, Vol. IV. p. 615.

Zyrianovsk, a mining town in a rich silver-producing district among the slopes of the Altai Mountains, in the eastern corner of the Cossack (or Kirghiz) republic.

Zyrians, or SYRIÄNS, a Finno-Ugrian people of the north-east corner of European Russia, of middle stature, inclining to brachycephaly and fairness. They are few in number, but a wide area, partly Samoyed in population, in the old governments of Vologda and Archangel, was in 1921 made the autonomous territory of the Zyrians or Komi; capital, Ust-Sysolsk. See PHILOLOGY, Vol. VII. p. 101.

THE END.

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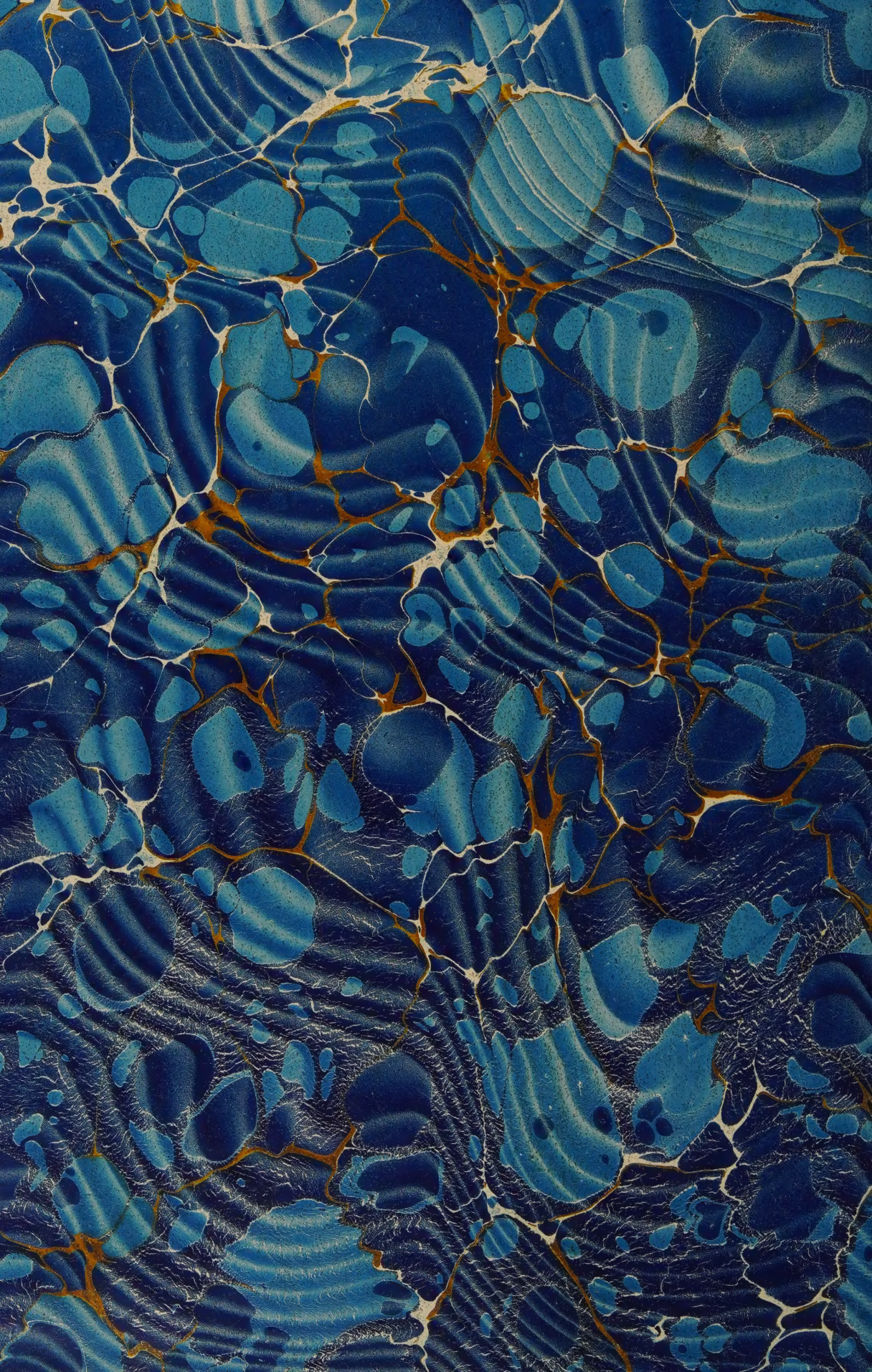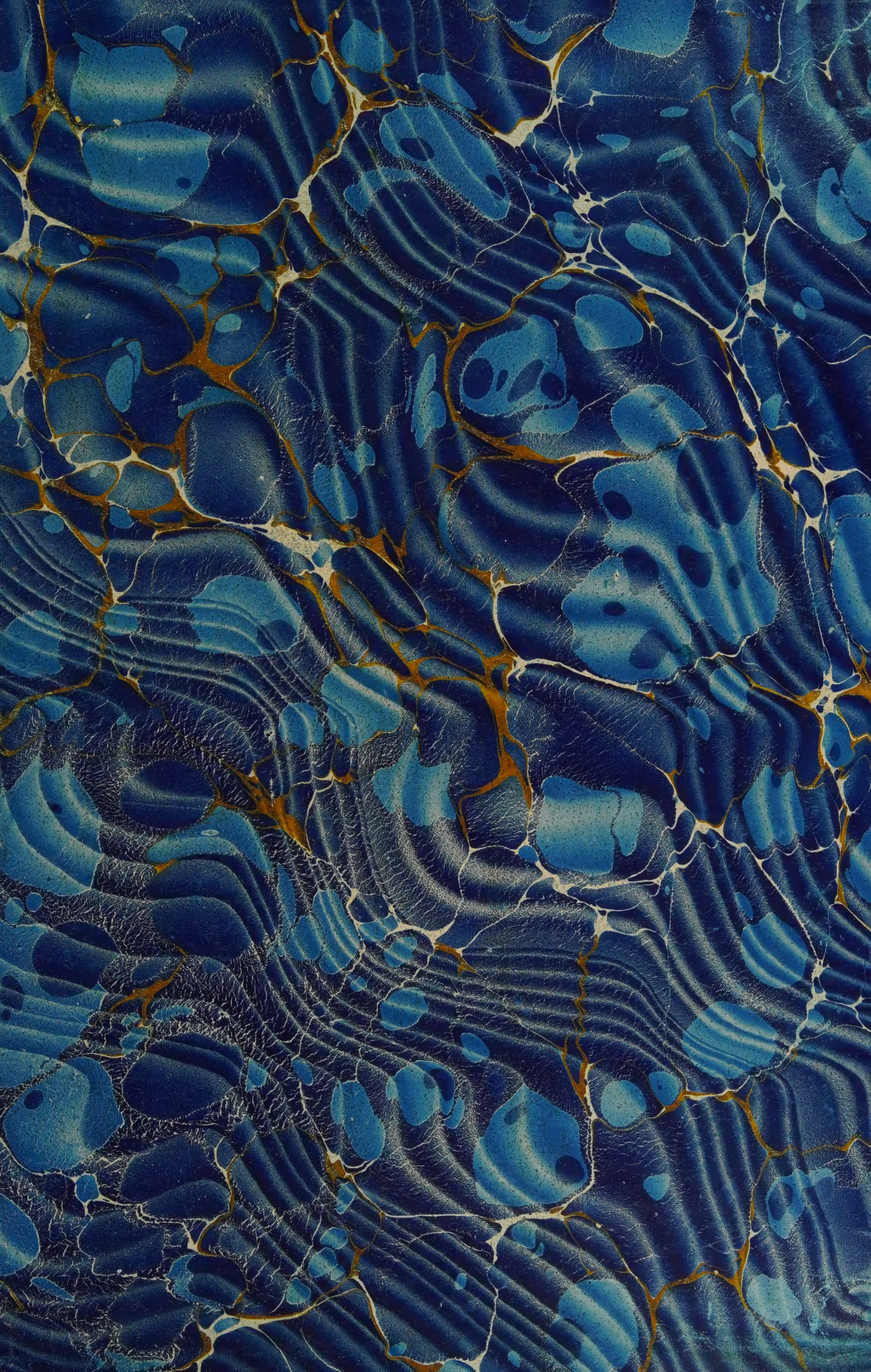
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